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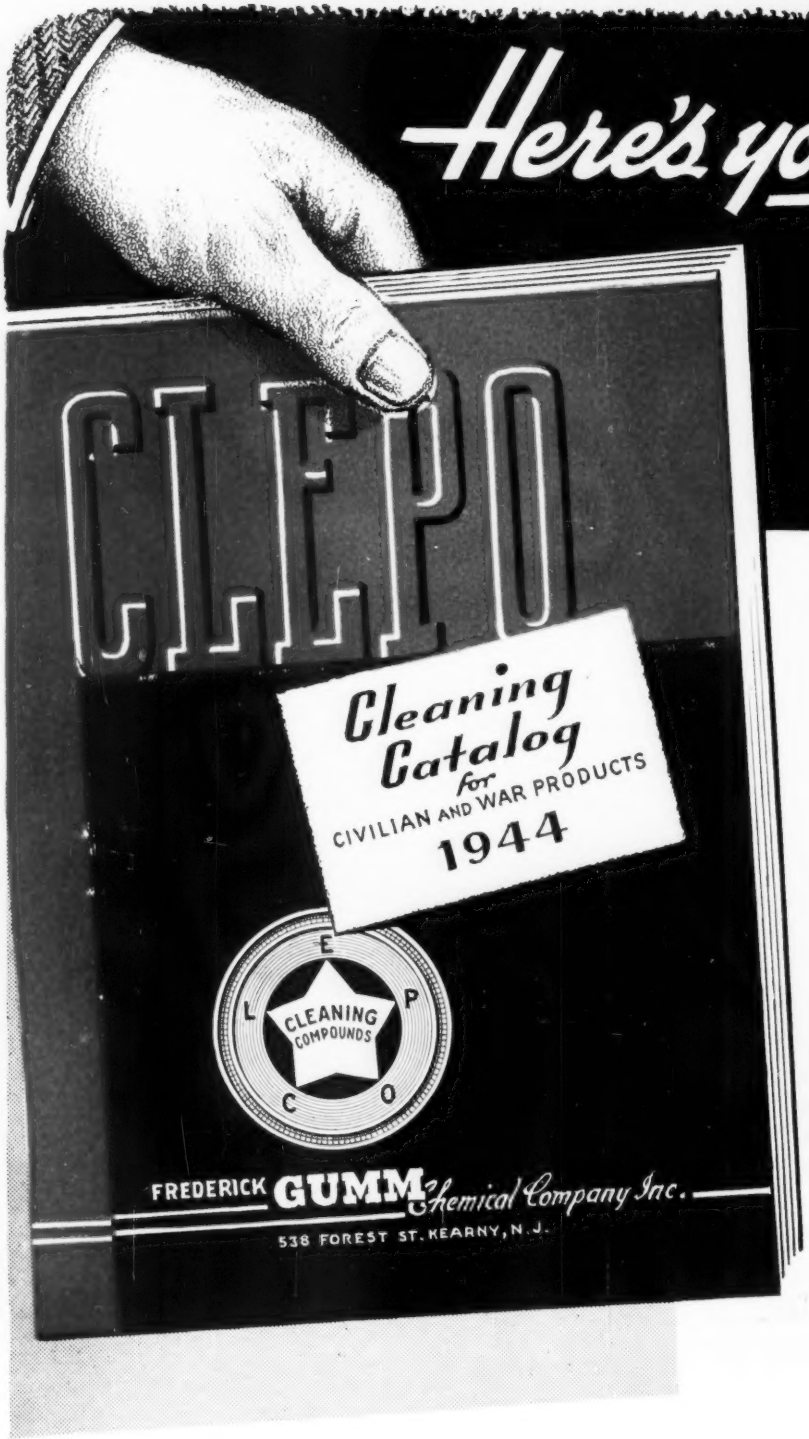

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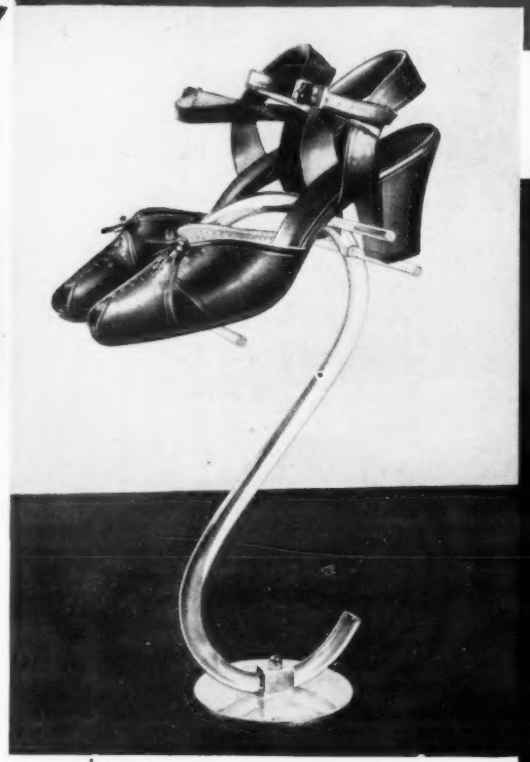

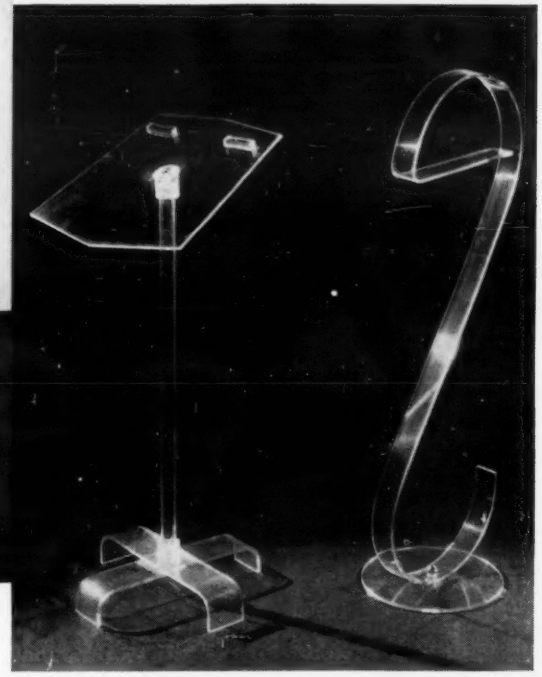

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Burring, Buffing and Polishing . . . Manufacturers and Specialists in the Development of Production Methods and Compositions

VOL. 42, NO. 5 METAL FINISHING MAY, 1944
PREPARATION, ELECTROPLATING, COATING

DESIGN FOR PLATING

The inability of product designers to accept plating as an operation equal in importance to fabrication has always been the plague of the metal finishing industry. This disregard, unfortunately communicated to management, was mainly responsible for the plating department being relegated, in the old days, to a dark corner of the plant.

In recent years, the importance of the plating operation has been receiving the recognition due it and progressive designers have been impressed with the necessity of eliminating, whereever possible, sharp bends and recesses which might be difficult to plate and to polish. The automotive and electrical appliance manufacturers were pioneers in this respect and the results of their efforts are readily apparent in the smooth lines of the last models produced before the war.

In the case of war materials, which are completely functional, it would be expected that ease of finishing could not be considered in their design, and the plater is forced to accept such designs and to plate the articles, as specified. This leads to some ridiculous situations.

In too many cases threaded parts, machined to close tolerances, are required to be plated with 0.0002 inch thickness of cadmium to meet the specification. If the plater applies this thickness, he meets the specification but finds that the parts are unacceptable because the edges of the threads are built up so much that the gauge will not go on. Since undercutting to allow for the thickness of deposit is rarely practiced, the plater has a choice of either putting on a thinner deposit, which would be cause for rejection, or of etching away sufficient basis metal to allow for the deposit, which may result in pitting or roughening.

This is an unhealthy situation and should be corrected without delay. It should be obvious to the designer of war materials that one cannot apply a deposit 0.0002 inch thick to a part that is machined to allow a tolerance of 0.0001 inch and expect a fit. If plating to a specified thickness is required, this should be taken into account in the design of finely machined parts. Electrodeposition has made great advances but it cannot do the impossible.

Suggestions for Preparation and Heading of Polishing Wheels with Glue

By GERALD A. LUX*

Divine Brothers Company, Utica, New York

PART III

POLISHING is a heavier metal-removing process than buffing. Generally, surfaces finished by polishing are not expected to have the smoothness and reflectivity of buffed surfaces. In Part I of this series, polishing was defined as: "The smoothing of a metal surface by means of abrasive particles attached by adhesive to the surface of wheels or belts."

Regardless of the type of polishing wheel chosen for a particular operation, it cannot be used as such, until it has a "head" of abrasive grains satisfactorily bonded to its face or periphery. The correct "heading" or "setting up" of polishing wheels requires skill, experience and knowledge of the factors involved. Without proper preparation and heading, the best polishing wheel cannot perform successfully. For this reason, this article will outline the fundamentals of preparing and heading polishing wheels and make recommendations for the efficient use of polishing wheel glue. In a subsequent issue, the standard types of polishing wheels will be considered, with special reference to their construction and applications.

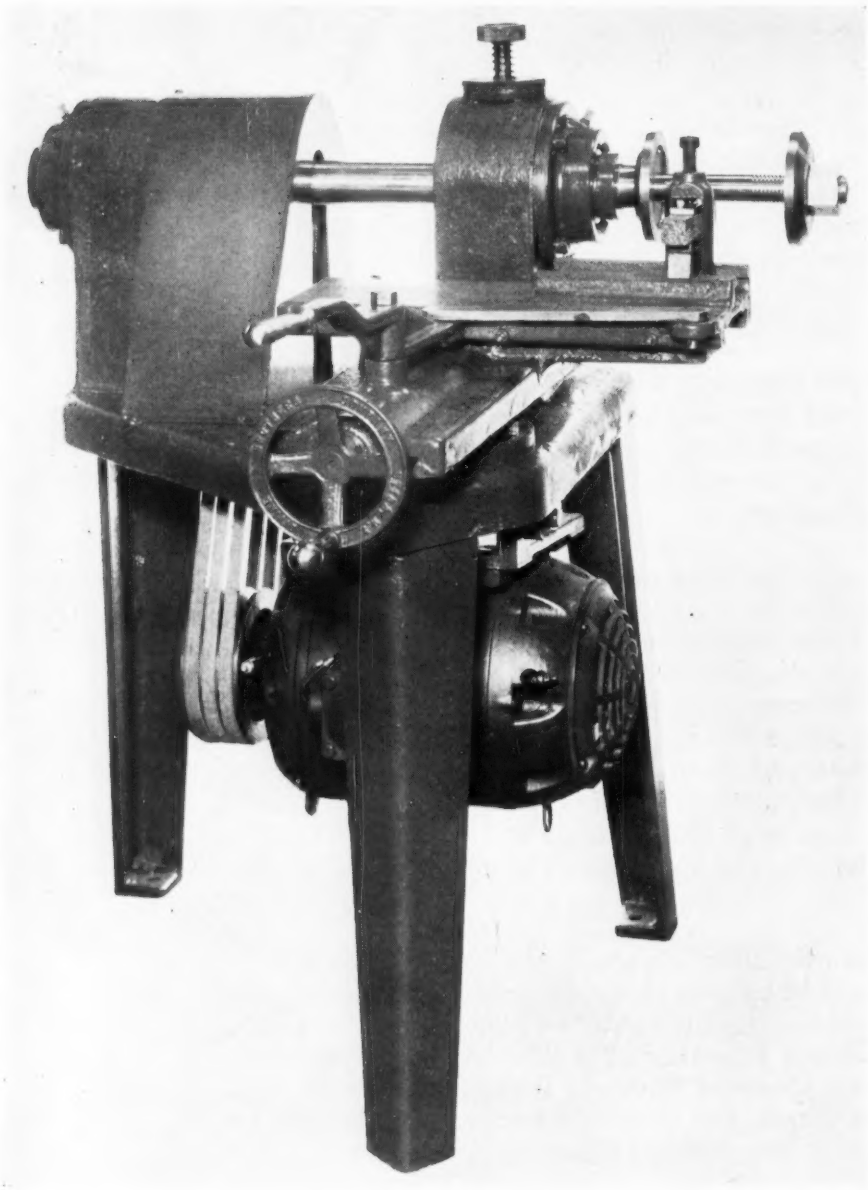


Fig. 1. Wheel Dressing Machine.

Preparation of Polishing Wheels for Heading

A new polishing wheel should be balanced. Its face should be "dressed" and "trued" by rotating it against an abrasive brick or sandpaper. The face should then be "sized" by brushing on a thin coat of the glue solution, allowed to dry, sandpapered smooth, resized, dried and resanded. This treatment, with a thin glue solution, impregnates the face of the wheel and provides a receptive base for uniform adhesion of the glue coat that will hold the grain. Care in selection of the concentration of glue used for the "sizing coat" is necessary. Too thin a solution will penetrate deeply and tend to harden the wheel, with consequent loss of flexibility. Too heavy a solution will prevent sufficient penetration to enable the glue to "lock" or "key" into the wheel face.

Sizing is not necessary before reheading a polishing wheel, unless the head has been worn down below the sizing coat or unless it is to be reheaded with a finer abrasive grain. Then, the old head of abrasive grain and adhesive should be completely removed by dressing it off on a wheel dressing machine (Figure 1) with an abrasive brick or diamond tool. This is known as the dry method and is preferred by most polishers for many kinds of wheels. A wheel washing machine (Figure 2), specially designed for removing abrasive heads by the wet method, is also available; an even film of moisture gradually loosens the abrasive head, the wheels being removed from the machine as soon as the head is soft. In either case, preparation for heading is similar to the procedure for a new wheel. Reheading with the same abra-

* Present Address: c/o Oakite Products Inc., New York, N. Y.

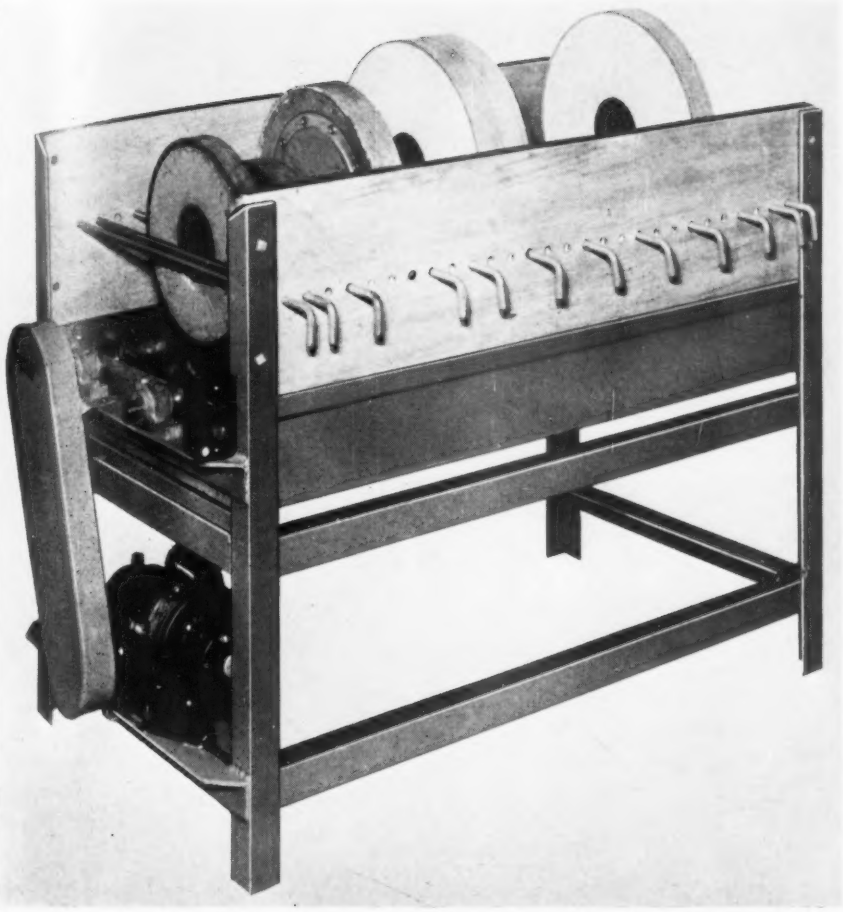


Fig. 2. Wheel Washing Machine.

Fig. 3. Cabinet Type Electric Glue Heater.

ive grain or a coarser grain should not be attempted without dressing off the major portion of the old head. This dressing provides a true, even base for the new head. Failure to remove the used head results in thick, uneven heads. Obviously, the flexibility and performance of such a wheel is different; yet polishers, following this unwise practice, complain that their polishing wheels increase in hardness with continued use.

Glue for Heading Polishing Wheels

Glue has been the old stand-by for heading polishing wheels for many years. The polishing trade's particular requirements of glue for this application, determined by long study and experience, are toughness, flexibility, high melting point and strength. This type of glue has the inherent characteristics of all animal glues. Recognition of the fact that the adhesiveness or strength of glue is decreased by bacterial attack and by heating continuously to temperatures above 140° F. is important to glue users. For this reason, glue suppliers emphatically recommend that: (1) Glue pots and brushes be washed and scalded or treated with a bactericide before use, (2) Glue mixtures be heated in thermostatically controlled glue heaters (Figure 3), and (3) Glue mixtures be made up freshly in small quantities for immediate use, rather than in large quantities and kept at working temperature for several hours.

The concentration of the glue solution used to bond the abrasive grains to a polishing wheel determines to some extent the effective life of the wheel head produced. By effective life is meant the number of pieces satisfactorily polished by a wheel head, not its life in terms of hours or days. The common tendency in the trade is to use glue solutions too concentrated, with the result that the grains are almost completely imbedded in the film of glue. An abrasive grain, imbedded in a dried glue film so that only 20% of it projects from the glue, cannot "cut" as deeply, or for as long a time, as another grain with 35% projecting above its glue bond. When the grain in a head is worn down to its glue base, the wheel is said to be "glazed" and unfit for aggressive cutting. Such a wheel head can be "sharpened" temporarily by rotating it against a steel wire brush. Its depth of cut is materially decreased, however, and, accordingly, the time required to polish a part is increased. Because wheels headed with high glue concentrations can tolerate more "sharpenings" without loss of their grain, the idea has grown that heavy glue solutions effect an economy. The loss in production and increase in polishing labor costs cannot verify this. Table I shows the glue concentrations, in percent by weight, recommended for heading polishing wheels with the commonly used grain sizes. Some special cases may require deviations from these recommendations, but, in the average plant, these values have been found satisfactory.

TABLE I—Recommended Glue Concentrations for Heading Polishing Wheels

Size of Grain	*% Dry Glue (by Weight)*	*Pounds of Water to Mix With 1 Pound of Dry Glue*
No. 36	45	1.22
No. 46	40	1.50
No. 60	35	1.86
No. 90	33	2.0
No. 120	30	2.3
No. 150 and finer	25	3.0
Wheel Sizing Coat	18	4.5

Heading of Polishing Wheels

Table I provides the recommended glue concentrations for the various grain sizes. For convenience, the weight of the water to be added to one pound of ground dry Standard Emery Glue (as designated in the trade) to produce the various concentrations has been included.

The weighted quantities of ground glue and cold water should be mixed in a *clean* pot with a *clean* paddle. Cover the pot to prevent loss of moisture and allow this mixture to "soak" at room temperature for at least two hours. (Flake and cake glue should soak at least 8 hours.) Glue behaves as a gel or colloid. It does not dissolve in water. Rather, it swells and may be said to attempt to "dissolve" or encompass the water with which it is mixed. "Soaking" at room temperature allows this action to proceed naturally. When soaked, the covered glue and water mixture in the glue pot should be heated, with occasional stirring in a thermostatically controlled glue heater to the working temperature of 140°-150°F. (It is desirable that the temperature be checked with a thermometer.) In this temperature range, glue solutions have a viscosity that is quite low and they can be readily applied with a brush.

To head a polishing wheel satisfactorily, certain precautions are necessary. Convenience, efficiency and labor costs demand that the glue pot, the support for holding and rotating the wheel, and the grain trough be close to each other. The grain and the wheel should be warm (85°-100°F.) to prevent chilling and consequent "setting" or "jelling" of the glue before the wheel can pick up its full load of grain in the rolling operation. For the same reason, no time should be lost when applying the glue solution to the wheel or in transferring and rolling it in the grain trough. Skill is required to apply the glue quickly and evenly to the wheel face without "skips". Skill is required, also, in rolling the glued face of the wheel in the grain with an even pressure and forward motion to obtain uniform distribution of the grain around the wheel. With a short grain trough (one not long enough to permit one complete revolution of the wheel in the grain), the best "set-up man" cannot be expected to produce uniform heads. In plants heading a large number of wheels daily, the wheel heading machine (Figure 4) is of interest. With it, uniform pressure and rotation of the wheel in the grain are assured. It also has a device for heating the grain in the pan of the machine.

Fig. 4. Polishing Wheel Heading Machine.

It is customary to apply two coats of glue and grain to the polishing wheel in heading it. The second application of the glue and rolling in the grain is performed within 15-30 minutes (depending upon the grain size; fine grain sizes require shorter time). The time interval between coats is important. If the second coat of grain is applied too soon, the grain in the first coat will be disturbed or may be picked up by the glue brush. If the first coat has dried too long, the two coats will not bond together and "spalling" (scaling) of the top coat will occur in use.

Drying of Wheel Heads

It has been stated earlier that glue does not dissolve in water, but swells and attempts to encompass the water. Two hours were stated as the time required for this action. The reversal of this process, or "drying" of the glue, is much slower. After the glue and grain head is applied to a polishing wheel, the mixture "sets", due to the cooling of the glue mixture and consequent rapid increase in its viscosity. The abrasive head of a wheel, a few minutes after heading, might be likened to a suspension of grain in a gelatine dessert. Obviously, such a head is not capable of withstanding the abuse of modern polishing operations. It is necessary to reduce the water content of the glue to 10-15% before the glue can hold the grain securely to the polishing wheel. Glue loses moisture slowly under normal room conditions. A glue film dries or gives up its moisture from its exterior first and then from its interior. This prevents accelerating its drying by application of heat. The surface may be caused to lose its moisture, but the interior will retain its water and soft, gel-like characteristics. Experience has shown that the maximum assistance to the drying of glue and grain wheel heads is provided by storage in a well ventilated room at a temperature of 70-85°F. and a relative humidity of 50%. Under these optimum conditions, 48 hours are necessary to lower the moisture

(*Concluded on page 269*)

Salvage by Electrodeposition

By HAROLD NARCUS

Chief Chemist, Plating Process Corp., Holyoke, Mass.

PART II—NICKEL AND IRON

THE next important method of salvage which is used more extensively in England than in the United States and which will probably replace a great deal of industrial chromium plating after the war, is heavy nickel plating. Needless to say, the acute shortage of nickel anodes and its salts prevents extensive use of this method in this country at the present time. However this type of plating offers the following principal advantages:

(1) Ease of machining of nickel after heavy plating as compared to chromium.

(2) Higher current efficiency, faster rate of deposition and better throwing power of the nickel plating bath.

(3) Cheaper installation resulting from cheaper rack and plating tank construction.

(4) Less power consumption for plating.

Included in the list of parts commonly plated with heavy nickel deposits are: Worn machine parts, mismachined parts, piston rods, valve stems, wrist pins, armature shafts, compressor rods, pump shafts, paper mill and lithograph rolls, lathe beds and saddles, spline shafts, hydraulic rams and other parts too numerous to mention.

Although the hardness of nickel is not as great as that of chromium, it is as high in value as that of annealed tool steel if properly applied from a suitable bath. The resulting coating is much more corrosion-resistant than that of chromium and, hence, is more adaptable when both hardness and corrosion-resistance are desired.

The nickel is usually applied directly upon the steel base. If the steel is properly cleaned, adhesion of the nickel is remarkably good. Tests have shown that the nickel itself and the nickel-steel bond are stronger in shear than the steel basis metal. Deposits up to .050" in thickness (0.005" for corrosion-resistance) are considered practical although even thicker deposits have been used without evidence of trouble. Worn parts are usually turned down on a lathe until all scored areas are obliterated. This insures concentricity of the deposit. The part may then be polished to give a smoother surface. No pits or recesses should be evident prior to plating.

Cleaning is perhaps more important in this type of plating than in chromium plating, since in the latter the chromic acid electrolyte itself has some cleaning qualities.

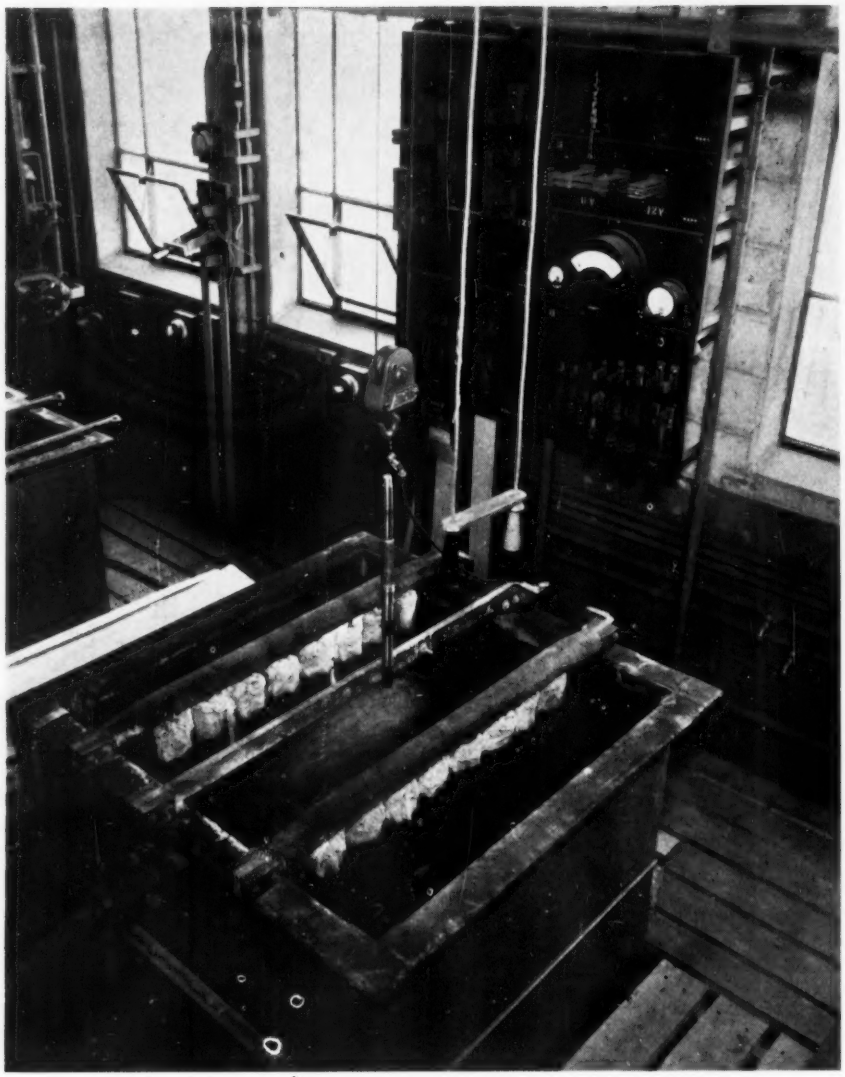
A good procedure to follow is to degrease the part after machining, then scrub it with hot alkaline cleaner and pumice, rinse, and then dry. The part is then masked with a suitable stop-off lacquer (cellulose ester formulations are recommended) or high melting-point waxes where plating is not desired. It is important that the stop-off materials do not contain organic impurities which would contaminate the nickel plating bath or the cleaning solutions prior to plating and that they adhere perfectly to the stopped-off areas. A cathodic alkaline treatment is recommended for 3 minutes at about 10 amp./sq. ft. and 150°F. in a good proprietary cleaner, rinsed thoroughly and followed by an acid etch treatment which is determined by a metallurgical analysis of the basis metal. Mild, high carbon or nickel-molybdenum steels receive an anodic treatment in 25% by weight H_2SO_4 at 150-200 amp./sq. ft. for 3-5 minutes at room temperature. Cast-iron is handled by an anodic treatment in 25% H_2SO_4 at 100 amp./sq. ft. for 3-5 minutes at room temperature. Nickel steels are best etched anodically in 25% H_2SO_4 at 25 amp./sq. ft. for 5-10 minutes at room temperature; after this time interval, the current density is increased to about 200 amp./sq. ft. for 1 minute followed by cathodic treatment for 2-3 seconds. The part is then thoroughly rinsed and nickel plated to required dimensions allowing for grinding down to blueprint size.

Nickel Plating Baths

The type of bath used depends upon

Courtesy The International Nickel Co.

Thread end of shaft being masked with a wax coating. The section above the area to be plated is painted with a resist.



Courtesy The International Nickel Co.

Reconditioning a worn pump shaft. Photo shows shaft suspended above tank and ready for plating.

the properties required of the nickel deposit. For corrosion and wear resistance, hard nickel deposits from the following bath are recommended:

Nickel sulfate	24 oz./gal.
Ammonium chloride	4 oz./gal.
Boric acid	5 oz./gal.
Temperature	120°-140°F.
Current density	30-50 amp./sq. ft.
pH (electrometric)	5.6-5.8
Hardness of deposit	40-48 Rockwell "C"

This bath gives a hard deposit with little tendency to crack. The rate of deposition is about 0.0025" per hour at 50 amp./sq. ft. and at 100 amp./sq. ft. about 0.005" per hour. With proper agitation and filtration even higher rates of deposition can be obtained.

In connection with the work of Wesley and Carey, a moderately hard nickel (20-26 Rockwell "C") shows excellent promise. This bath concerns the deposition of a fine-grained, smooth, hard deposit of nickel from the following solution:

Nickel chloride	40 oz./gal.
Boric acid	4 oz./gal.
Temperature	140°F.
pH (electrometric)	2.0
Current density (without agitation)	20-50 amp./sq. ft.
(with agitation)	100 amp./sq. ft.

This bath offers a 50% reduction in tank voltage and power consumption, ease of chemical control, wide plating range, high anode and cathode efficiency, less pitting and less tendency to form nodular or treeing deposits especially when attempting thick plates.

When a soft nickel deposit with maximum ductility is desired and hardness is not the chief concern, the following bath serves the purpose:

Nickel sulfate	44 oz./gal.
Nickel chloride	4 oz./gal.
Boric acid	5 oz./gal.
Temperature	140°F.
pH (electrometric)	2.0
Current density	25-100 amp./sq. ft.
Hardness	76-83 Rockwell "B"

The higher range of current densities requires agitation and perhaps filtration. Pitting can be relieved by using hydrogen peroxide.

If a hard coating of chromium is still desirable over a nickel deposit, the nickel chloride-boric acid bath previously mentioned is best suited for this purpose as the under-layer to the hard chromium. About 0.003"-0.005" of chromium should remain after grinding and lapping the part to size. Hence, the amount of nickel deposited should be applied with this in mind.

In machine grinding heavy nickel deposits, the low annealing temperature of nickel demands that the deposit should not heat up over 450°F. or some of the hardness will be lost. Both machining and grinding of heavy nickel deposits require some care and experience. In grinding, too drastic a cut in one operation should not be taken to prevent overheating or fracture of the deposit. In machining, a tool steel (18-14-1) tungsten steel (high cobalt-low molybdenum) is recommended by The International Nickel Company. In the Transactions of The Electrochemical Society [71, 263 (1937)] Bonilla reported that in England the following procedure is recommended for machining nickel:

"For turning down nickel, high speed tools are necessary, set 1/64 in. to 1/32 in. below center, with cutting angle 70° and all clearances 10°. The cut should preferably begin at the center of the work, for safer handling of the natural overgrowth of deposited metals at the ends. A soluble oil lubricant helps."

Iron Plating

Probably the most recently utilized method of salvage is through the medium of iron deposition. There were very few applications for iron plating until the beginning of the present conflict. Today it is increasing in prominence because of the abundance and relative cheapness of iron and the ease of its removal from an electrolyte at low cost. It is dissolved readily as anode and it can be deposited as a hard and brittle metal which by heat

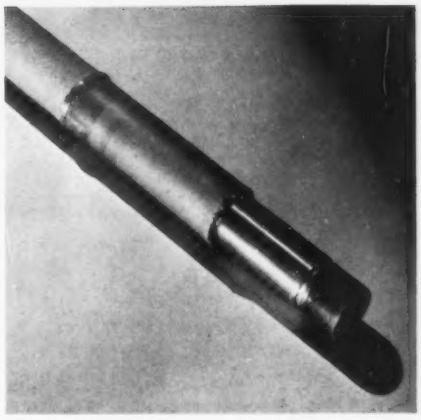
atment can be converted to a soft d malleable metal. Because of its rity the deposit is more resistant to rosion than other forms of iron. posits having a Brinell hardness of 5-360 have been obtained. It ma- nes well and can be hardened by rburizing or nitriding, can be welded d has high magnetic properties.

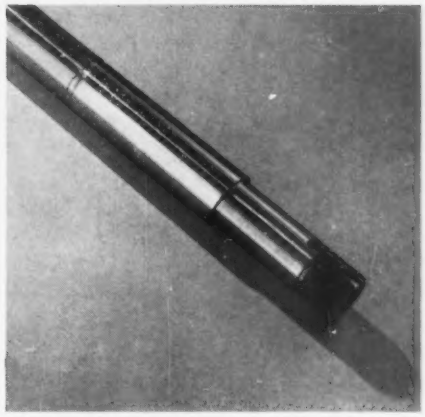
Several solutions are being used for commercial application of iron. A ple bath is a concentrated solution ferrous ammonium sulfate (50 oz./- .) at room temperature and a cur- t density of 20 amp./sq. ft. Higher peratures, about 60°C., allow her current densities of about 60 p./sq. ft. at pH 5.0-5.5. This bath is ch less corrosive than most baths, s subject to objectionable oxida- n and gives harder deposits.

If a softer, more ductile deposit is ired the following is an excellent th:

Ferrous chloride	50 oz./gal.
Calcium chloride	25 oz./gal.
Temperature	185°-200°F.
Current density	60-70 amp./sq. ft.

The throwing power of these iron ting baths parallels that of nickel ting solutions. Pitting is reduced the use of proper wetting agents d by bagging the anodes. In general e hardness of the deposit is lowered increasing the acidity and tem-





Courtesy The International Nickel Co.

After plating — After machining

Hard nickel plated shaft.

perature of the bath or by decreasing the current density.

In a paper presented at The Electrochemical Society convention this year, an improved iron plating solution was described by W. B. Stoddard, Jr. This solution contains:

Ferrous chloride	200-500 g./L.
Manganese chloride	3- 5 g./L.
Gardinol W. A. powder (as anti-pitter)	1 g./L.
Temperature	150°-200°F.
Current density	50 amp./sq. ft.
pH	2.0

As in the case of nickel, if the desired hardness of chromium is sought, the deposit of iron, after machining and hardening by carburizing or nitriding, is topped with a layer of hard chromium and is then ground and lapped to size. The ferrous ammonium sulfate solution is best used as the underlayer to the hard chromium coating.

At our plant we have utilized a unique process which has worked splendidly on shafts which are worn as much as 1/16″-1/8″ on the bearing diameters. The part is properly metal-sprayed in the usual manner with a high carbon steel and after machining to a good finish, is plated with hard chromium of sufficient thickness to be ground down to finished size leaving a 0.003″-0.005″ layer of chromium.

SUGGESTIONS FOR PREPARATION AND HEADING OF POLISHING WHEELS WITH GLUE

(*Concluded from page* 266)

ntent of glue to the degree necessary r producing its maximum strength.

Breaking Up or Cracking Up Wheel Heads

Leather or fabric polishing wheels e used instead of solid grinding heels, because a degree of flexibility adaptability is required in a metal ishing operation. An unbroken ad of grain and dried glue on the ce of a polishing wheel is not very xible or adaptable. To "soften" the heel head, it is customary to break up or crack it. This is done by nding the wheel on a flat, hard sur- ce. The head is struck with light ows by a 1½-inch diameter pipe *eld at an angle of* 45° to the axis of e wheel. After each blow, the wheel rotated slightly until a complete ries of parallel cracks is produced the head. The process is repeated ith the pipe held so that the cracks used by the second series of blows rm an "X" with the cracks of the first series of blows. This procedure is desirable with either glued disc polishing wheels or polishing wheels of the compress type construction.

Balancing Polishing Wheels

A new polishing wheel should be balanced. An unbalanced wheel running at polishing speeds is potentially dangerous, fatiguing to the operator, harmful to the polishing lathe and wheels, and cannot produce smooth, uniformly polished surfaces. Therefore, the "balance" of the wheel should be determined and corrected, if necessary. This can be done by attaching the requisite amount of lead securely to the wheel and thus offset the wheel's uneven distribution of weight. Some polishing wheel manufacturers provide balancing tubes and balancing lead of proper diameter to fit the tubes. A balancing tool, or ways, is necessary to make this operation accurate and effective.

Conclusion

An attempt has been made to indicate the procedures and importance of correct preparation and heading of polishing wheels. Without an understanding and appreciation of these factors, efficient and satisfactory polishing cannot be accomplished, regardless of the type of wheel used. Part IV of this series will consider the standard types of polishing wheels and their application in polishing operations.

Corrections in Part II

Page 203—second column—in the line immediately above Figure 1, the word "impossible" should have been the word "possible".

Page 203—third column—the sentence beginning on the third last line has a phrase omitted. It should read, "In general, a soft, loosely-woven sheeting *is used for "coloring" operations and a harder tightly-woven sheeting* for "cutting down".

Page 206—second column—in the thirteenth line from the top of the page, the word "section" should read sections.

Recovery of Free Acid from Pickling Liquors

By HARRY W. GEHM

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Acetone has been found superior to solvents previously tried for promoting the crystallization of copperas from pickling liquor. While not satisfactory for the treatment of continuous-process liquor, batch liquor responds well from the standpoints of ferrous sulfate removal, acid concentration, quality of separated copperas, and acetone separation. A system for applying this process without appreciable acetone loss may be of practical value.

NUMEROUS processes have been devised for the recovery of acid from spent pickling liquors. They were reviewed by Hodge[1] in his summary on acid wastes. Most of these processes consist of separating ferrous sulfate from the liquor by crystallization brought about by evaporation and cooling. Many types of operating techniques were developed to separate the maximum quantity of copperas. The best of these processes left considerable copperas in solution and hence did not prove attractive to industry.

A process patented by de Lattre[2] differed markedly from the others in that methanol was employed to produce crystallization. The alcohol was recovered by distillation and the recovered acid made up to strength and returned to the pickling vats. The crystalline copperas was dried and stored.

This process seemed to lend itself to improvement through the possible use of solvents now available at relatively low cost. Preliminary experiments were made in which the relative effectiveness of several alcohols and ketones for promoting crystallization of the copperas was determined. Of the several solvents employed, acetone proved most effective. When added in sufficient volume, the copperas could be rapidly separated to a high degree from spent liquor. The results obtained appeared to justify further study of this method of treatment.

Batch Liquor

The first liquor studied was of the batch type and had the following percentage analysis: ferrous sulfate 15.75, sulfuric acid 4.88, water 79.37. The treatment consisted of adding 250 ml. of the liquor slowly to a measured volume of acetone which was constantly agitated at a high rate. The liquor containing the crystals was then vacuum-filtered, pressed, and washed with 10 ml. of acetone on the filter to displace acid filtrate. The filtrate was passed through a packed and heated rectifying column which delivered almost water-free acetone at the top and acetone-free acid at the bottom. The recovered acid was analyzed for free acid and copperas content.

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A series of five 250-ml. samples were treated by th method, using 100, 200, 300, 400, and 500 ml. of aceton The percentages of acid and ferrous sulfate in the recover liquors are shown in Figure 1. These curves show th optimum results, in terms of copperas removal, were o tained when 400 ml. of acetone were employed, the co centration of ferrous sulfate dropping from 15.75 to slight under 1 per cent. Acid concentration, due to loss of wat with the crystallized salt, reached a maximum of 8.36 p cent when 250 ml. of acetone were used. The ferrous sulfa content of this recovered liquor was 2.45 per cent. Th

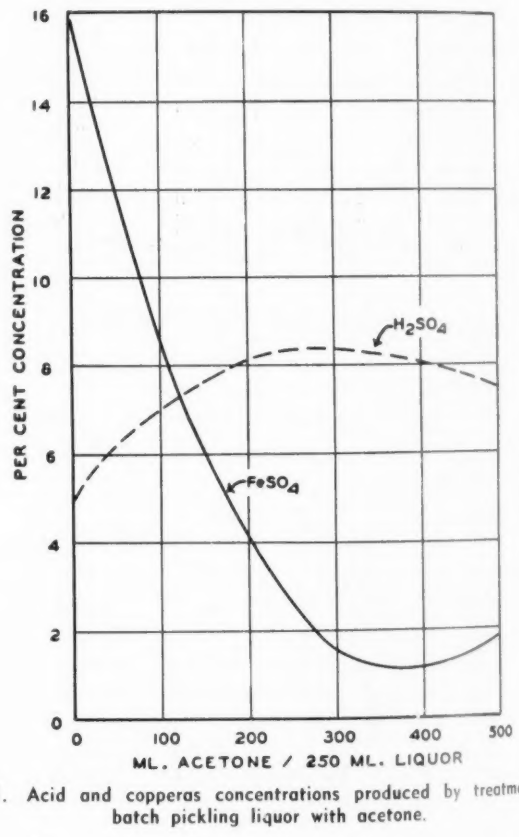

Fig. 1. Acid and copperas concentrations produced by treatment batch pickling liquor with acetone.

above concentration of ferrous sulfate would be again re duced on the addition of make-up acid and water. Since n great difference existed between the acid concentration whe 250 or 400 ml. of acetone were used, and the ferrous sulfat content of the recovered liquors was low in each case, th volumes of 250 ml. of liquor to 250 ml. of acetone or a 1 to ratio was selected for further study of this proces.

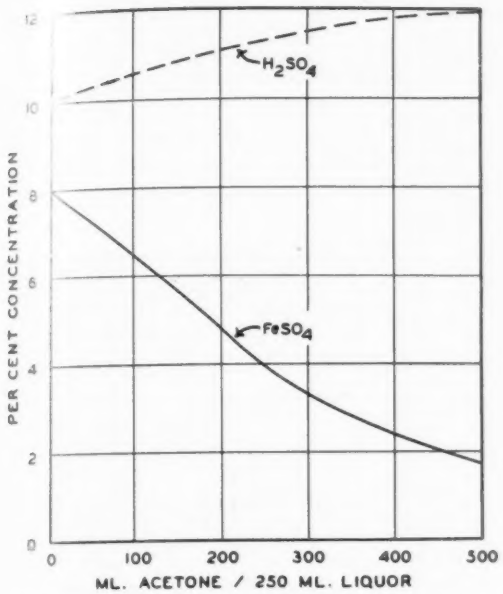

Fig. 2. Acid and copperas concentrations produced by treatment of continuous process pickling liquor with acetone.

A run employing these proportions was made in which all the pertinent data were obtained. This run is presented in Table I and summarized as follows:

1. Ferrous sulfate content of the liquor was reduced almost 85 per cent.

2. Acid concentration was increased over 71 per cent.

3. An acid-free copperas was produced which, while containing about 10 molecules of water of crystallization, appeared dry.

4. The copperas before acetone removal contained 7 per cent of the ketone.

5. Only 3 per cent of the acetone used was lost, despite the fact that the system employed was not closed and no special precautions were taken against acetone loss.

6. The acetone separated from the recovered acid was practically water-free, and the recovered acid was completely acetone-free.

An effort was made to reduce the ferrous sulfate content of the recovered acid still further by adding make-up acid prior to acetone treatment. Sufficient concentrated sulfuric acid was added to a sample of liquor to raise the acid to 10 per cent. This sample was treated with an equal volume of acetone in the manner previously described. The ferrous sulfate content of the recovered acid was determined and found to be 2.46 per cent. This was practically the same as that found in similarly treated liquor to which make-up acid had not been added.

Continuous-Process Liquor

Treatment similar to that applied to batch liquor was used for liquor from continuous pickling process. This liquor had the following percentage analysis: ferrous sulfate 7.88, sulfuric acid 10.00, water 82.12 (by difference). A series of tests were made by treating 250-ml. samples of liquor with 50, 100, 250, 325, and 400 ml. of acetone respectively. Acid and ferrous sulfate concentrations were determined in the recovered liquors.

Results of this treatment are shown in Figure 2. Optimum treatment was obtained when 400 ml. of acetone were employed. This treatment reduced the ferrous sulfate content from 7.88 to 2.3 per cent and increased the acid cencentration from 10 to 11.8 per cent.

Discussion

Experimentation revealed that acetone was superior to the fatty alcohols, such as methanol, used in the de Lattre process for promoting crystallization of copperas from spent pickling liquors. Batch liquor was best treated with an equal volume of acetone, producing 85 per cent removal of ferrous sulfate and an increase in acid concentration of 71 per cent. From 1000 gallons of this waste treated, 680 gallons of acid would be recovered. When brought up to the original 15 per cent acid concentration and volume, with strong acid for re-use, the ferrous sulfate concentration could be reduced to as low as 1.6 per cent.

For such a process to operate economically, high acetone recovery would be necessary. In the laboratory experiments 97 per cent recovery was obtained in an open system. Large-scale closed-system operation of such a process should realize recoveries well in excess of 99 per cent. The copperas obtained from this process was free of acid and in a relatively dry state. In this form it could be dumped or marketed, if possible.

TABLE I. TREATMENT OF BATCH PICKLING LIQUOR WITH AN EQUAL VOLUME OF ACETONE

(250 ml. liquor weighing 310 grams contained: 48.75 grams $FeSO_4$, 15.53 grams H_2SO_4, 246 grams H_2O; 250 ml. acetone weighed 197 grams)

Acetone		Copperas	Recovered Acid
Recovered from liquor, 231 ml; sp. gr. 0.789		Acetone-wet copperas, 108 g.	Vol. recovered liquor, 170 ml.
Remaining in copperas, 20 ml.		Acetone-free copperas, 94 g.	Wt. recovered liquor, 186 g.
Recovered from copperas, 14 ml.		$FeSO_4$ present 32.16 g.	Wt. $FeSO_4$ present, 4.56 g.
		Water present, 51.84 g.	Wt. H_2SO_4 present, 8.36 g.
			Wt. H_2O present, 166 g.
Total used	250 ml.	Water of crystallization in copperas, 10	% $FeSO_4$, 2.45
Total recovered	245 ml.	pH of copperas, 3.5	% H_2SO_4, 8.35
Total lost	5 ml.	Free acid, trace	
Recovery	97%		

Efforts to improve the separation of copperas by pre-addition of make-up acid were without success. It is possible, however, that the quantity of acetone required to give similar results to equal volume addition could be reduced if make-up acid was added prior to treatment.

Spent liquor from the continuous pickling process could be treated to produce considerable reduction in ferrous sulfate content. Volumes of acetone almost twice that of the liquor were required, and only a small concentration of acid resulted. This occurred because the ferrous sulfate concentration in this liquor was too low to remove much water as water of crystallization.

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The Ancient Art of the Gold Beater

By JOSEPH DANFORTH LITTLE

GOLD beating as an industry is as ancient and honorable as it is fascinating and wonderful. It is highly skilled craft, although the methods used have changed very little in hundreds of years. Homer, the Greek poet, in his "Odyssey," written centuries before the dawn of the Christian era, relates that cattle were prepared for sacrifice by having their horns covered with gold. For this operation he tells us that an anvil, a hammer, and pliers were employed. Pliny, the elder, the Roman writer who succumbed to the suffocating vapors and gases from the eruption of Vesuvius which buried Herculaneum and Pompeii in 79 A. D., mentions the art of gold beating and gives us, what appears to be, the earliest reference to the gold beating process. He tell us it was first used in Rome about 100 B. C. He also tells us that the ornaments of the Capitol were then gilded and that this form of embellishment spread to other public buildings and private houses. He further tells us that, in gilding, the gold was laid on marble with the white of an egg and on wood with a special glue containing red earth and chalk. He states that an ounce of gold could be beaten into 700 leaves four fingers square.

During the sixteenth and seventeenth centuries, the craze for gilding became so strong in France, that laws were passed, forbidding its use in interior decoration and on furniture. The German monk, Theophilus, in the ninth century speaks of protecting the gold with parchment, during the beating and that it is here that the cutch comes into play. In England in early days, the Gold Beater's Guild was one of the most influential in all London. The gold beater's craft fought the fishmongers and drapers or tailors for precedence and bloody conflicts between these were not uncommon. The ancient gold beaters in London were known by the big yellow arm and hammer at the door.

The Ancient Egyptian Gold Beater. From a Fresco at Thebes. 18th Dynasty. After Prisse d'Avennes.

The art of working in gold seems to have come from the Egyptians and it is practiced in almost the same way today as it was by gold workers of ancient Greece and still more ancient Egypt. In that ancient country gold beating was done, so archaeologists tell us, as early as 2000 B. C. or about 4,000 years ago and the gold beaters today in New York City and Boston are making gold leaf practically in the same way, that is a small piece of gold is laid between two skins and hammered by hand until it is the thickness or thinness of practically nothing at all. As to the exact method used by the ancients, no account is available but there is little doubt but that they were much the same as those of today.

The Egyptians used gold leaf on tombs, mummies and on mummy cases. Some of the gilding is so thin that it resembles modern electro-gilding. These ancient people gathered the precious metal from the sands of the Nile and on the interior plateau called Belad-el-Tibbiar (Gold Country). Before the time of Moses, the Egyptians had gilded the statuettes in the temple of Serapis, applying the foil over a coat of sized chalk. The Persians at the battle of Plataea had beds which were covered with gilded and silver ornaments. From Asia this custom passed to Rome, where the beds used by the women were gilded.

The skill of the gold beater has for thousands of years defied the mind and hand of the inventor and the machine

Gold Beater of the 15th Century.

age expert, who have made many attempts to substitute machines for manual workers but with the exception of a few refinements or minor details, no machine has been invented that will accomplish the desired result. The process employed by the ancients has defied the march of progress and proven more than a match for the experts and therefore the same methods of making gold leaf have prevailed for many centuries. (*Editor's Note: During the last few years great advances have been made in the production of gold leaf by electrodeposition.*) The art of the gold beater looks simple, very simple, but it takes a man three or four years to learn to beat gold properly. With hand labor entering so largely into the process of manufacture, the output per man-hour is necessarily small. The actual beating is done by men, only those with long experience being capable of producing the best leaf, while a great deal of the subsidiary work, preparing, cutting and booking is performed by women.

The first feature that impresses one on entering a gold beating establishment is the noise made by the workmen who stand in front of the granite blocks pounding with their hammers. They strike with hammers of various sizes

eighing from 7 to 20 pounds, on ooks of parchment, and with eight or n men hammering at one time, the oise is considerable. The only modern te in the whole operation of gold ating of today is the electric motor hich some gold beaters use to turn e rollers when rolling out the ingot gold, as it comes from the United ates Assay Office. This is one of the w advances made on the methods ed hundreds of years ago. However, any of the gold beaters of today ll use the rollers turned by hand when lling out the ingot.

Men in an unusual business are usu- y very courteous and willing to en- hten a stranger with information garding their business. This the iter discovered when he called on r. Orville C. Correll, president of the l-Purpose Gold Corp. of Brooklyn. ter giving considerable data regard- g the making of gold leaf, he per- tted the writer to make a tour of spection of this gold beating estab- hment which, in addition to gold ating, operates a machine shop, pro- cing war materials, about 90% of s establishment being given over to r work. The gold beaters of today nd before the same kind of a block d swing the same kind of a hammer d go through the same processes and otions of pounding, pounding and unding, as did the gold beaters of ndreds of years ago.

How Gold Leaf Is Made

An ingot of pure gold is supplied the United States Assay Office. The got is about 3 inches long, one and half inch wide and one inch thick. is small ingot weighs 12½ to 13 nces and at the present price of gold uld cost about $425.00. Pure gold too soft for commercial use and is erefore alloyed with a very small ount of copper and silver. The ount of alloy will vary according to e grade of gold leaf to be made. Most the gold leaf is about 22½ carat e. If no alloy were added the gold f would be too soft for practical use.

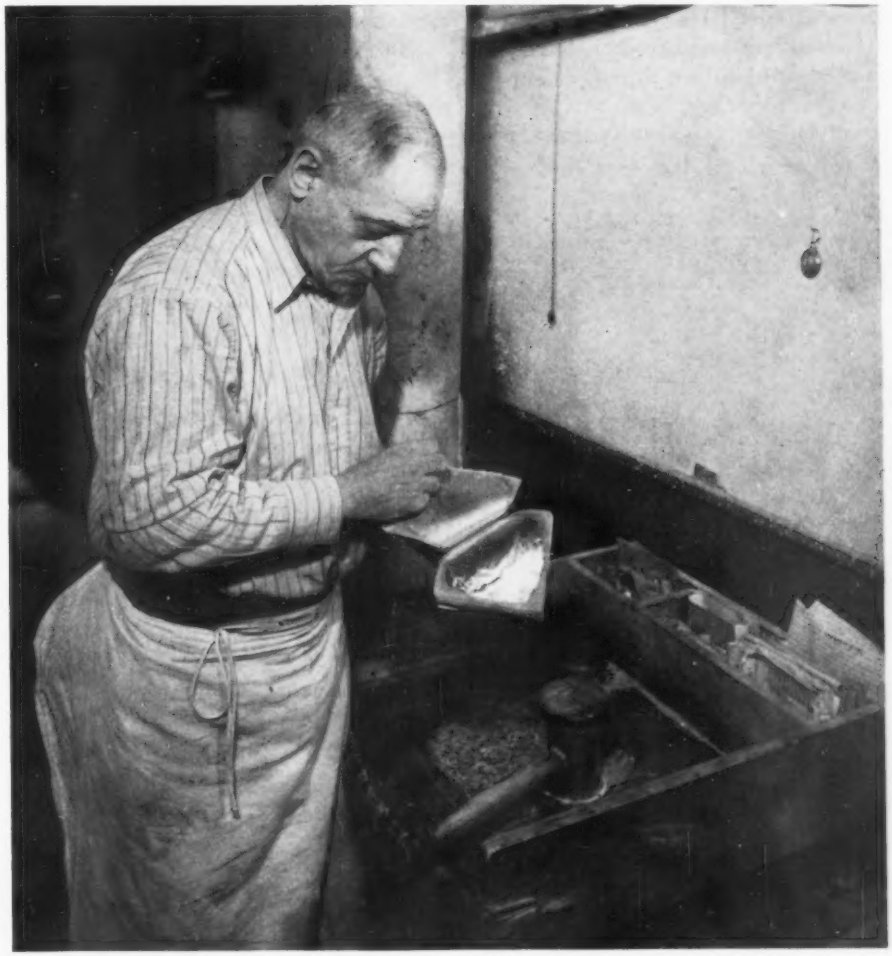
The gold ingot with a small amount alloy is placed in a crucible, melted d poured. The ingot, after cooling, in the form of a small bar about 5 ches long, an inch wide and about e-eighth of an inch thick or about e size of two small yeast cakes if ced end to end. It is then rolled, heated and rolled again until it is

Courtesy All-Purpose Gold Corp.

Above—Gold Beaters at work. Hammers are not lifted each time but bounced, the beater's hand merely guiding them properly. It takes about 50,000 hammer blows to make gold leaf, and a block of pure gold weighing a little over six ounces will eventually cover 500 square feet.

Below—The Gold Beater examines the finished product.

Courtesy All-Purpose Gold Corp.



reduced to a long ribbon about one-thousandth inch thick and 120 feet long. It is now ready for the gold beater.

The gold beater receives his material in the form of a ribbon about an inch wide and 24 feet long. The ribbon is cut into 200 squares, each weighing about six grains. From this ribbon to the finished leaf the gold is not touched with the hand but is manipulated with boxwood or bamboo pincers. The squares of gold are placed in a package of alternating squares of vellum or parchment. The package resembles a small book about one inch thick and four inches square. There are 200 leaves in each package and these are held in position with wide bands of parchment. This package or book, called a "cutch" (sometimes spelled "kutch"), is ready for the first operation which is known as "beating the cutch." It is placed on a block of granite or marble supported by a heavy wooden post or beam one foot square and approximately three feet high. This post is set down into the ground, to overcome the vibration and to provide a resilient base for the granite. In the old gold beating shops the rebound was obtained by having the shop in the basement so that a large block of wood could be imbedded in the earth and on this was mounted a granite block. This setting gave resiliency for the rebound. In the All-Purpose shop this has been changed by mounting the blocks on heavy springs, so they are able to beat gold on the fourth floor of the building instead of the basement.

The workman, to accomplish the desired result, hammers for about a half an hour with a hammer weighing seventeen pounds. These hammers have short wooden handles, with heads of cast iron, four inch faces and convex surfaces. Some of the hammers are very old having been handed down from generation to generation of gold beaters. Under the heavy measured blows of the hammer the leaves or squares of gold begin to expand or stretch. With constant hammering for about a half an hour the leaves of gold, which were about one and a half inch square have spread and reached the edge of the parchment and are now about four inches square. Fortunately for the workman, after each blow the hammer rebounds to about shoulder height, so that the second blow and all succeeding blows are much easier than the first. The important thing is to guide the hammer with the right hand, and after each blow, to very deftly turn and twist what appears to be a package of paper, about four inches square and less than an inch thick.

Courtesy All-Purpose Gold Corp.

Gold Cutting Dept. This is one of the operations in the gold beating industry performed by women. Work tables are surrounded on three sides by glass, for even a slight breath of air on the leaf of gold must be avoided.

The strokes are delivered at the rate of about fifty to the minute. It is interesting to note that the parchment is obtained in England and consists of discarded sixteenth and seventeenth century documents, such as old deeds and testaments on parchment of very fine quality. Nothing has been found to take the place of the parchment. Paper or cloth would disintegrate in a very short time. In beating gold, the art of the workman consists in striking that the gold will always be thinnest in the center. He must hammer with evenness all over the square in order that the sheets of gold may extend without losing their form, and he must keep the thickest part near the edges.

The 200 leaves of gold are then removed from the cutch with pincers of bamboo and laid one by one on a cushion and cut into four squares with a "skewing" knife, so that now there are eight hundred small sheets of gold. Instead of placing these gold leaves back between parchment, each piece of gold is placed between two pieces of goldbeater's skins. This package is known as a "shoder," and consists of 800 goldbeater's skins about 4½ inches square. It is now ready for the second stage of making gold leaf.

The skins are from the large intestines of oxen and their preparation is a jealously guarded secret, controlled by two English firms. For twenty centuries or more goldbeater's skins have been used in interleaving gold leaf when hammering gold into leaf form. It takes five hundred oxen to supply enough membrane to make one shoder and the cost for one pack is approximately $150. Three months are consumed in the treatment of the membrane which, when finished, may be beaten for months without injury. In the past thirty years the governments of Europe and the United States have been seeking a suitable substitute for this precious membrane, which is also used in making gas cells for lighter-than-air craft. The skins, as taken from the cattle, are small and cost fifteen to twenty-five cents each. Processing brings the cost to ten dollars per square yard. An airship the size of the Los Angeles required thirty thousand square yards of this membrane, for its gas cells.

The goldbeater resumes his gold beating and the shoder is hammered from two to four hours with a much lighter hammer, known as a spread-

hammer, weighing about 12 pounds. His hammering is now more careful, more delicate and precise than before. The leaves of gold, having spread to the edges of the shoder, are now about four inches square and are removed with the bamboo pincers or tongs. The leaves are, one by one, laid on a leather cushion or pad and each is again cut into four parts with a unique little instrument known to the craft as a "wagon."

This little instrument is like a child's miniature sled with parallel runners and is made of malacca. The gold leaves are now so thin that the edge of a steel knife would leave a ragged edge. The wagon, with its malacca runners, cuts them perfectly, as it is applied to each leaf with a very slight pressure, and divides each leaf again into four equal parts. These leaves are handled one at a time with bamboo pincers and made into "moulds." These moulds must not be confused with the iron mould used for the ingot of gold. They are identical with the shoder, except that they are slightly wider on each side and are composed of alternating leaves of gold and goldbeater's skins. When they are filled with 800 pieces of gold in each, they will make four books, each about five inches square and about one inch thick and each will weigh only a few ounces.

In placing these thin leaves of gold between the skins it is necessary to brush both sides of the skins and smooth out the gold leaf to prevent the gold from sticking to the skins. This operation is done with a Siberian hare's hind foot. The hind foot of an American jack rabbit will not answer for this purpose. The fur on the hind foot of this rabbit, that roamed the wastes of Northern Europe or Siberia is very soft and for brushing the gold leaf nothing has been found to take its place. A powder, made of pulverized stone mixed with shaving soap and allowed to dry before using, is employed with this rabbit's foot. At this point the gold is so thin that it adheres quickly to anything it touches and if crumpled in the hand, the particles disappear in the pores of the skin. Frequently all that is necessary to flatten out the thin gold leaf is a faint breath of air, yet placed on a sign or on a book cover or on a shop window it will wear for years.

The mould, consisting of the goldbeater's skins and the gold leaves, is placed in a press and heated to drive

Courtesy All-Purpose Gold Corp.

A corner of the Gold Laying Dept. This is another operation in the gold beating industry which is usually performed by women.

out any moisture. It again goes through the beating process and is beaten for five to six hours with hammers weighing seven pounds. This is the third and final beating operation and the finishing time will depend upon the weather, the eye, and the steadiness of the arm. In beating the mould the greatest skill on the part of the beater is required. Now, more than at any time during the entire process, is the quality of the finished leaf determined.

Under the constant hammering, the gold leaves will have extended so that they become about five inches square and of the desired thinness. The skins are now withdrawn and each leaf is removed with the wooden pliers, and one by one the eight hundred leaves are laid on a leather pad or cushion and cut with the wagon into four pieces. The gold leaves are now so thin that in laying them on the cushion they are "blown out flat" with the breath, an operation that requires considerable skill. They are then trimmed to the final size. The gold leaves are translucent and will stand continuous beating although they will tear like a sheet of paper. At this point the gold leaf having expanded to the edges of the skins are of the requisite thinness of about three-millionths of an inch.

Up to this point gold beating has been a man's job, no woman ever having entered the field of gold beating. Women and girls now separate the leaves from the mould and make them into books, each book containing 25 sheets of gold leaf, placed between sheets of paper. These gold leaves are $3\frac{3}{8}$ inches square or $3\frac{3}{8}$ inches by $3\frac{7}{8}$ inches. Each little square of gold that we started out with, has now spread to sixteen sheets nearly four times the size of the original ones.

The goldbeater is by no means independent of the weather conditions. The weather has a great deal to do with successful gold beating. If the day be damp, the gold sticks to the mould and the results are not as satisfactory as those obtained on a fine and sunny day. If the day be cold and frosty the gold becomes dull, so goldbeaters are all for fine, warm and sunny days.

A skillful goldbeater can hammer out a $\frac{5}{8}$ inch cube of gold into a sheet of gold that will cover a floor 12 feet square. It is possible to hammer one grain of gold so thin that it will cover 75 square inches. A single ounce of this precious metal, in the hands of an expert goldbeater can be made to spread and cover 25,000 square inches or about 175 square feet. If this single ounce were in a strip one inch wide, it could be made to extend over 2,000 feet.

THIS IS WASHINGTON–

By George W. Grupp
METAL FINISHING's Washington Correspondent

Baltimore-Washington Branch Meeting At the April meeting of the Baltimore-Washington Branch of the American Electroplaters' Society, the first stag meeting in about a year, Mr. L. A. Critchfield of the United Chromium Corporation gave an interesting and informative talk on "Copper and Zinc Plating With Pyrophosphate Solutions" which he illustrated with about fifty different samples of work and with curve charts which he sketched on the blackboard. He first described how the desire to overcome the dangers of cyanide baths resulted in research and in the discovery of the pyrophosphate solutions. These solutions are free from toxic fumes; and contact with them does not irritate the skin as cyanide does. No ventilation is necessary; and citric acid is used as a buffer. The solutions, he said, were free rinsing. Filters should be used to remove all organic matter since such matter increases the brittleness of the deposit. In copper plating the pH range is from 7 to 8½. The speed is 50 to 60 amperes per square foot. Copper cathode sheet is the most suitable for anodes. The tank can be brick or rubber lined. Air agitation results in a smooth finish and no brightener is necessary. In zinc plating, however, a brightener is necessary. In zinc plating the pH range is from 11 to 11½. An unlined steel tank can be used and the degree of corrosion resistance of this type of plating is determined by the purity of the zinc.

WPB Field Offices Powers Increased On April 8, 1944, the WPB announced that arrangements have been made to grant field offices of the Board the power to process applications for priority assistance on Form WPB-541 (formerly PD-1A) involving not more than $25,000. And these same offices will be empowered to pass on applications for construction of facilities up to $100,000. Field offices will continue to have authority to grant the right to use the Controlled Materials Plan maintenance, repair and operating supplies (MRO) symbol on Form WPB-541 applications.

Private Enterprise Faces Crucial Test The American system of private enterprise will face a crucial test in the post-war period, according to a study, "Price Making in a Democracy," by Dr. Edwin G. Nourse, made public on April 17, 1944, by the Brookings Institute. Permanent prosperity can be expected only if corporation executives and union officials follow price policies that make for high production. The study points out that unless productive capacity is aggressively used to produce more adequate consumers' goods than the masses have hitherto enjoyed, a popular demand for extensive government economic control is likely to arise.

Alarm Clock Production Procedure Established Limitation Order L-275 was issued on April 14, 1944, for the purpose of establishing the routine and procedure for the production and distribution of new spring driven and electrically operated alarm clocks. According to this order, manufacturers will be assigned individual quarterly quotas for production and delivery of alarm clocks. Only alarm clocks with movements and cases approved by the WPB may be made. Approval of models will be based largely on the economy of production and minimum use of critical materials.

1,200,000 Alarm Clocks for Second Quarter The Non-Jeweled Clock & Watch Manufacturers Industry Advisory Committee of the WPB were told by the Board's experts that many of the 1,200,000 war alarm clocks permitted for production in the second quarter of 1944 must go to fill military requirements. At this meeting it was also disclosed that some electric alarm clocks will be produced and distributed during the second quarter; and a limited production of non-jeweled low-priced wrist watches will be authorized for distribution to nurses, student nurses, and nurses' aides.

Aluminum Oxide Abrasive Restrictions Revoked Restrictions on the use of coarse grit aluminum oxide abrasive grain in bonded and coated abrasive products, and on some types of rubber bonded abrasive products were removed by the revocation of Conservation Order M-319-a on April 11, 1944.

Aluminum Restrictions Eased Additional uses of aluminum for essential products has been granted by amending on March 24, 1944, Supplementary Order M-1-i. Aluminum restrictions have been liberalized for usage for (1) aluminizing or calorizing, (2) anhydrous aluminum chloride, (3) cathodes for electrolytic refining of zinc and cadmium, (4) chemical processing equipment for use in manufacturing plants, provided that chemical action makes the use of other materials impracticable, (5) commercial radio equipment and all wire communications equipment, but only where aluminum, copper or copper base alloy was used in commercial production in the United States during 1939, 1940 or 1941, (6) electric bus bars, bare electrical conductors, and current-carrying accessories for conductors, (7) galvanizing, for addition to bath, (8) industrial spray guns and grease guns, (9) mechanical, electrical, drafting, engineering, geophysical, industrial, and laboratory instruments, (10) certain lighting equipment, (11) and many other items.

Blackplate Restrictions Lifted Supplementary Order L-103-b as amended on March 23, 1944, provides that "blackplate (including rejects) as allocated; electrolytic, waste-waste and frozen plate" may now be used for beverage bottle crowns.

Chromium Metal Exemption Poundage Reduced Supplementary Order M-18-a-1 was amended on March 27, 1944, for the purpose of providing that a processor or dealer may deliver to any person in any calendar month not more than 250 pounds of chromium metal without special authorization. Previous to this amended order 3,000 pounds were exempt.

Copper Surplus and Deficit On April 5, 1944, the Copper Division of the WPB announced that "1944 brass mill operations . . . indicates, at best, a small surplus of copper by the end of the year." Then it went on to say: "Requirements figures have been adjusted to represent realistic demand and mill capacities." Then the announcement added: "However, copper production figures were based upon ideal operating conditions and maximum output. Therefore, in view of growing manpower shortages resulting from the military draft policy, a deficit of copper might result." This may sound a bit confusing, but that is the way the Washington bureaucrats think.

Electric Flat Iron Production Authorization Sought Applications for authorization to produce a portion of the 2,200,000 electric flat irons under a special emergency program have been made by over 30 different manufacturers. Nine of these have already been granted permission to produce a total of 200,000. WPB field officials investigate each applicant's ability to manufacture irons without interfering with war work.

The Employment of Returning Soldiers The War Department recently released a booklet entitled "Information For Soldiers Going Back to Civilian Life" for distribution to honorably discharged men for the purpose of telling them among other things how to get a job. Under the heading of "Getting a Job" the soldier is advised that if he wants his old job back he must make application for re-employment within 40 days after the date of his discharge. On this subject it points out that "Your former employer is required to give you your old job back (or its equivalent) if he possibly can, at the same rate of pay and with the same seniority and privileges you previously had."

"ARE WE RUSHING YOU TOO MUCH, JOE?"

Employment of Children Being Watched The National Advisory Police Committee of the Federal Security Agency recently released a manual on the "Techniques of Law Enforcement in the Treatment of Juveniles and the Prevention of Juvenile Delinquency." In the chapter under "Unlawful Employment of Minor" police officers have been instructed to be on the alert to enforce the prevention of child labor "because of the war, the labor situation has become critical to the point that many children of school age are deserting the classroom for the shop, factory, office and other employment."

Enameled Ware Variety Expanded According to Limitation Order L-30-b as amended on April 3, 1944, the manufacturers of enameled sauce pans, sauce pots, basins, bedpans, and instrument trays may now make these enameled wares in a wider variety of sizes than previously. The amended order also permits the production of enameled dippers and metal covers for enameled steamtable pans. This amended order does not mean an over-all increase in production of enamel ware because iron and steel quotas have not been increased.

Flatware Restrictions Amended Manufacturers of flatware have been granted permission to use chrome stainless steel, from restricted stockpiles, in the making of knives, forks, dessert spoons, and teaspoons for sale to hospitals, war plant cafeterias, hotels, restaurants, and other institutional users of flatware by Limitation Order L-140-b amended on March 21, 1944. Stainless steel flatware for home use is still prohibited. *Specifications for the minimum thickness of silver plating* and minimum gauges of metal for flatware to fill non-military orders are still in effect in the amended order.

Galvanized Ware Quotas in Second Quarter Fixed Manufacturers of galvanized pails and buckets, wash tubs, wash boilers, funnels, fire shovels, and storage cans for petroleum products will be permitted to use iron and steel in the second quarter of 1944 at the same rate as in the first quarter of this year, when they were given supplementary quotas which increased their permitted rate of usage from 50 per cent to 92½ per cent of the quarterly average in the year ending June 30, 1941. This quota was granted in Direction 2 to Limitation Order L-30-a issued on March 20, 1944.

Plating Restricted on Electric Motor Controllers General Conservation Order L-250 was amended March 30, 1944, to provide that "no copper, chromium, nickel, cadmium, or alloys or finishes, thereof shall be used in the manufacture of enclosing cases, name plates, identification plates or door handles for electric motor controllers."

Preference Ratings for Class B Facilities Rules governing acquisition of preference ratings and allotments for the manufacture of Class B facilities by a person who will make such facility for his own use when he is not regularly engaged in the manufacture of such facilities have been clarified in CMP Regulation No. 1, Direction No. 34, as amended March 28, 1944. The amended direction points out that such a manufacturer "may follow the procedure in this direction in the same way as described for a Class A product. If you make the Class B facility in the normal course of your business, you must get the material by use of a CMP-4B application which you ordinarily file."

Production Reduction Problem According to W. Ellison Chalmers, chief of staff, of the WPB Labor-Management Drive Headquarters reduced schedules are already making their appearance in war production. In discussing this he said: "When schedule reductions appear the reaction of workers can unfavorably effect war production in three ways: 1. By suggesting that war material is no longer urgent. This reaction may cause a general letdown, including an effort to stretch out the job. 2. In an individual plant, it may result in an increase in absenteeism and turnover. And third, it may mean failure to get the best use of manpower in critical labor areas. All three," he added, "directly affect war production programs and stem from morale. As always, morale is not improved by exhortation, but by understanding teamwork, and a constructive program." Continuing his comments on this problem he said: "Labor-Management Production Committees can function constructively on all three phases. But they first need to know the facts. Many rumors fly around a plant and community. Factual information is equally important to combat false rumors and to be the basis for constructive planning of actual reductions." And the Drive Headquarters is ready to aid any metal finishing industry in solving the production reduction problem which will become increasingly serious with the coming of peace.

Renegotiation Forms Released Standard forms of contractors' reports required by the Renegotiation Act of 1943, to be filed by all war contractors and subcontractors in connection with the renegotiation of their direct and indirect sales to the War Department, Navy Department, Treasury Department, Maritime Commission, War Shipping Administration, and Reconstruction Finance Corporation and its four subsidiaries—Defense Supplies Corporation, Defense Plant Corporation, Metals Reserve Company and Rubber Reserve Company, have been released by the War Contracts Price Adjustment Board. Forms and instructions for their preparation may be had from the agencies or from the Assignments and Statistics Branch, Renegotiation Division, Room 3D 573, The Pentagon Building, Washington 25, D. C.

Renegotiations Regulations Released in Part A portion of the new Renegotiation Regulations to govern renegotiation of war contracts for the fiscal years ending after June 30, 1943, was released on April 18, 1944, and published in the Federal Register. The parts released by the War Contracts Price Adjustment Board are: Chapter I which deals with the authority and Organization for renegotiation; Chapter II which treats on the procedure; Chapter VI which contains certain War Contract Board forms; and Chapter VIII which consists of statutes, orders, joint regulations and directives.

Scheduling Primer Issued by WPB During the past month the Materials and Scheduling Office of the WPB Office of Operations issued an illustrated 16-page pamphlet called "Scheduling Primer." This pamphlet explains how WPB scheduling operates under General Scheduling Order M-293 as amended February 10, 1944. A copy may be had from local WPB offices.

What is a "Special Item"? The term "special item" as used in Controlled Materials Plan Regulation No. 2 was explained in Interpretation No. 2 which was issued on March 20, 1944. According to this interpretation the term "special item" is one that a producer does not usually make, stock, or sell, and one which cannot be readily disposed of in the normal course of his business. As one can readily see, a product may be a "special item" to one firm, but the same product may not be such an item with another company.

Supplier May Reject Customer's Order In commenting on Interpretation No. 7 to Priorities Regulation No. 1 amended April 14, 1944, and Interpretation No. 9 to CMP Regulation No. 1, Walter C. Skuce, Director of the Controlled Materials Plan Division of the WPB said that these interpretations "recognize that some production processes are such nature that practicable minimum production quantities must be produced so that the war effort will not suffer loss of manhours and production facilities' time. The customer is not required by any WPB order to accept more materials than are covered by his purchase order. . . . And a supplier may reject his customer's order if it is less than the minimum which he regularly sells."

Tinplate Restrictions Temporarily Lifted For the period March 30, 1944 through September 30, 1944, inclusive, permission was granted to lift the inventory restrictions on the acceptance of tinplate for the manufacture of cans in the states of Washington, Oregon, California and Utah to permit can manufacturers to accept deliveries of materials that will be needed to meet the seasonal demand of the West Coast packing industry. This permission was granted by the issuance of Inventory Direction No. 15 on CMP Regulation No. 2 on March 30, 1944.

Typewriter Instructions Issued The Office of War Information, Management Services, Personnel Division, Training Section, is distributing an illustrated leaflet on how to make a typewriter last longer, including its finish. Operators of typewriters are asked to keep the leaflet "in the top right drawer of your desk, or on your consulting slide." If anyone believes that the personnel will carry out those instructions "once a week," as advised, he better take a bath in the river of common sense.

Shellac Order M-106 Revoked Revocation of Order M-106 under which shellac has been allocated since April 14, 1942, was reported April 21, 1944, by the War Production Board. The revocation order, was effective April 26. The quota of alcohol available to shellac producers recently was reduced from 100 to 50 per cent of their base period use by an amendment to Order M-30.

Padlocks Restrictions Eased The War Production Board has announced the removal of restrictions on the use of zinc in padlocks and permitted the manufacture of certain sizes formerly prohibited. Action is taken by an amended version of Schedule I of the hardware simplification order, L-236. Schedule I establishes simplified practices for builders' finishing hardware, cabinet locks and padlocks, and specifies permitted materials, types and sizes in 15 tables. Schedule I, as amended, makes changes only in Table XIV, covering padlocks. Unrestricted use of zinc and additional permitted sizes will increase production without use of additional manpower, Building Materials Division officials said, by utilization of equipment that was idle because of former restrictions. The demand for padlocks is much in excess of present production and the industry has an average backlog of eight months.

Can Enamel Manufacturers Can enamel manufacturers have been assigned an automatic preference rating of AA-2 to make it easier for them to procure raw materials for production of certain can enamels, the Chemicals Bureau of the War Production Board announced April 15. Their prior rating for this purpose had been AA-3.

Dictionary of Metal Finishing Chemicals

These pages comprise the seventeenth installment of the dictionary of chemicals used in the finishing industry.

This feature will continue to be a regular part of *Metal Finishing* until all related materials have been reviewed in alphabetical order.

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liquid. Generally the ratios between 1:4 and 1:1.6 all of which are usually liquids are called water glass and are used for acid proof cements and adhesives. Also known as Liquid Glass, Soluble Glass. Grades: Technical. Containers: Cans (1, 5, 25 lb.); Barrels (300 lb.); Drums (100, 300 lb.); Liquid in Cans (1, 5, 55 lb.); Drums (50, 100 gal.); tank cars.

Sodium Silicate-Meta: See Sodium Silicate.

Sodium Silicate-Ortho: See Sodium Silicate.

Sodium Silicate-Sesqui: See Sodium Silicate.

Sodium Silicofluoride: Na_2SiF_6. Mol. wt. 188.05. Sp. gr. 2.755. Also known as Sodium Fluosilicate. Hexagonal, colorless crystals or white powder. Decomposes when heated. Solubility, 0.75 at 20°C. and 2.5 at 100°C. Insoluble in alcohol. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5 lb.); Boxes (25, 50 lb.); Kegs (100 lb.); Bags (200 lb.); Barrels (276, 330, 360, 450 lb.).

Sodium Stannate: $Na_2SnO_3 \cdot 3H_2O$. Mol. wt. 266.74. Hexagonal, colorless crystals, white granules or powder. Solubility, 67.4 at 0°C. and 61.3 at 20°C. Insoluble in alcohol. Grades: Technical, C. P. Containers: Bottles and Cans (1, 5 lb.); Tins and Boxes (10, 25, 50 lb.); Drums (100, 300 lb.); Barrels (400 lb.).

Sodium Sulfate, Anhydrous: Na_2SO_4. Mol. wt. 142.05. Sp. gr. 2.67. M. P. 884°C. White crystals or powder. Solubility, 49 at 40°C. and 43 at 100°C. Grades: Technical, N. F., C. P. Containers: Bottles and Cartons (1, 5 lb.); Kegs (25, 50, 100 lb.); Drums (100 lb.); Bags (165, 175 lb.); Barrels (300, 375, 400, 540, 550 lb.).

Sodium Sulfate, Hydrated: $Na_2SO_4 \cdot 10H_2O$. Mol. wt. 322.21. Sp. gr. 1.464. Also known as Glauber's Salt. Colorless, efflorescent monoclinic crystals. Decomposes when heated to 32.4°C. Solubility, 5 at 0°C. and 40.8 at 100°C. Insoluble in alcohol. Grades: Technical, U. S. P., C. P. Containers: Bottles and Cans (1, 5 lb.); Cartons (1, 5, 10, 25, 50 lb.); Kegs and Drums (100 lb.); Bags (165, 200 lb.); Barrels (300, 325, 350, 400 lb.).

Sodium Sulfide: $Na_2S \cdot 9H_2O$. Mol. wt. 240.20. Sp. gr. 2.47. Also known as Sodium Monosulfide. Colorless, tetragonal, deliquescent crystals. Decomposes when heated. Soluble in water. Soluble in alcohol. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5 lb.); Kegs (100 lb.); Barrels (380, 430 lb.); 20% solution in Drums (30, 110, 200, 370 lb.).

Sodium Sulfide, Concentrated: See Sodium Sulfide, Fused.

Sodium Sulfide, Fused: $Na_2S \cdot xH_2O$. Also known as Concentrated Sodium Sulfide. Contains about 62% Na_2S. Reddish brown fused lumps, flakes or drops. Soluble in water. Grades: Technical. Containers: Cans (1, 5 lb.); Drums (125, 380, 400 lb.).

Sodium Sulfite: $Na_2SO_3 \cdot 7H_2O$. Mol. wt. 252.17. Sp. gr. 1.561. Colorless monoclinic crystals or granules. Loses water of crystallization when heated to 150°C. Decomposes when heated to high temperatures. Solubility, 33 at 0°C. and 196 at 40°C. Insoluble in alcohol. Grades: Technical, U. S. P., C. P. Containers: Bottles and Cans (1, 5 lb.); Boxes (25 lb.); Kegs and Drums (100 lb.); Barrels (325, 350 lb.).

Sodium Sulfite, Anhydrous: Na_2SO_3. Mol. wt. 126.05. Sp. gr. 2.63. Hexagonal prisms or white powder. Decomposes when heated to high temperatures. Solubility, 14 at 0°C. and 28 at 80°C. Very slightly soluble in alcohol. Grades: Technical, U. S. P., C. P. Containers: Bottles, Cans and Cartons (1, 5 lb.); Cans and Boxes (25, 50 lb.); Kegs (50, 100, 125 lb.); Barrels (400, 550 lb.).

Sodium Sulfocyanate: See Sodium Thiocyanate.

Sodium Sulfocyanide: See Sodium Thiocyanate.

Sodium Tartrate: $Na_2C_4H_4O_6 \cdot 2H_2O$. Mol. wt. 230.098. Sp. gr. 1.818. Also known as Sal Tartar. Colorless rhombic crystals. Solubility, 29 at 6°C. and 66 at 43°C. Insoluble in alcohol. Grades: Technical, Purified, C. P. Containers: Bottles and Cartons (1, 5 lb.); Kegs (100 lb.).

Sodium Tetraborate: See Sodium Borate.

Sodium Potassium Tartrate: See Potassium Sodium Tartrate.

Sodium Prussiate: See Sodium Ferricyanide and Sodium Ferrocyanide.

Sodium Pyrophosphate: $Na_4P_2O_7 \cdot 10H_2O$. Mol. wt. 446.11. Sp. gr. 1.82. Also known as Tetrasodium Pyrophosphate, TSPP. Colorless monoclinic crystals and anhydrous powder. Solubility, 5.4 at 0°C. and 93 at 100°C. Insoluble in alcohol. Grades: Technical, U. S. P., C. P. Containers: Bottles and Cartons (1, 5 lb.); Boxes (25, 50 lb.); Kegs (100 lb.); Barrels (300 lb.).

Sodium Pyrophosphate, Anhydrous: $Na_4P_2O_7$. Mol. wt. 265.95. M. P. 988°C. White powder. Insoluble in alcohol. Grades: Technical, C. P. Containers: Bottles and Cartons (1, 5 lb.); Boxes (25, 50 lb.); Kegs (25, 100 lb.).

Sodium Rhodanate: See Sodium Thiocyanate.

Sodium Rhodanide: See Sodium Thiocyanate.

Sodium Sesquicarbonate: $Na_4H_2(CO_3)_3 \cdot 2H_2O$. Mol. wt. 328.082. Sp. gr. 2.112. Monoclinic white crystals. Decomposes when heated. Solubility, 13 at 0°C. and 42 at 100°C. Grades: Technical. Containers: Bottles (1, 5 lb.); Kegs (100 lb.); Bags; Barrels.

Sodium Silicate: Compounds of varying composition formed by the reaction between sand and soda ash. For commercial uses the compositions vary between a ratio of 1 part sodium oxide to 4 parts of silica (1:4 silicate or $Na_2Si_4O_9$) to 2:1 (2:1 silicate or Na_4SiO_4). The ratios of 1:4 to 1:1.6 are usually used as adhesives and the ratios of 1:1.5 to 2:1 are used for cleaning purposes. The common grades are as follows:

SODIUM METASILICATE: 1:1 silicate or $Na_2SiO_3 \cdot 5H_2O$. Mol. wt. 212.15. M. P. 72.2°C. Solubility at room temperature about 48. Infinitely soluble above 72.2°C. Slightly hygroscopic, white free-flowing powder.

SODIUM ORTHOSILICATE: 2:1 silicate or Na_4SiO_4. Mol. wt. 184.06. This has the largest proportion of soda and is therefore the most alkaline. White free-flowing granules.

SODIUM SESQUISILICATE: 1.5:1 silicate. Exact formula not known but usually written as $3Na_2O \cdot 2SiO_2 \cdot 11H_2O$. M. P. 88°C. White free-flowing powder. Slightly more hygroscopic than metasilicate with about the same solubility.

WATER GLASS: 1:3.2 silicate. Sp. gr. ranges from 1.3 to 1.87. Viscous

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Abbreviations: Mol. Wt. = Molecular Weight; Sp. gr. = Specific Gravity; M. P. = Melting Point; B. P. = Boiling Point; Solubility figures, where given, are parts by weight in 100 parts of water; Technical = Grade usually used for industrial purposes; Purified or Pure = Better grade than Technical; U. S. P. = Conforms to standards of U. S. Pharmacopoeia; C. P. = Chemically pure, exceeding requirements of the U. S. P.; N. F. = Meets requirements of the National Formulary.

Sodium Tetraphosphate: $Na_6P_4O_{13}$. Mol. wt. 469.90. Sp. gr. 2.55. M. P. 600°C. Also known as Quadrafos. Clear glassy beads and white powder. Solubility, 165 at 20°C. and 178 at 95°C. Grades: Technical. Containers: Drums (60 lb.); Bags (20, 100 lb.); Barrels (450 lb.).

Sodium Thiocyanate: NaCNS. Mol. wt. 81.08. M. P. 287°C. Also known as Sodium Sulfocyanate, Sodium Sulfocyanide, Sodium Rhodanate, Sodium Rhodanide. Colorless, deliquescent rhombic crystals or white powder. Very soluble in water and alcohol. Grades: Technical, Purified, N. F., C. P. Containers: Bottles and Tins (1, 5 lb.); Crocks (25 lb.); Cases (30 lb.); Pails, Kegs (100 lb.); Drums (75, 100, 125, 150 lb.).

Sodium Thiosulfate: $Na_2S_2O_3 \cdot 5H_2O$. Mol. wt. 248.19. Sp. gr. 1.685. Also known as Sodium Hyposulfite, Hypo, Antichlor. Colorless monoclinic efflorescent crystals and granules. Decomposes at 48°C. Solubility, 75 at 0°C. and 302 at 60°C. Insoluble in alcohol. Grades: Technical, U. S. P., C. P. Containers: Bottles, Cartons and Cans (1, 5 lb.); Boxes (25 lb.); Kegs (25, 50, 100, 112 lb.); Drums and Bags (100 lb.); Barrels (350, 365, 375, 380 lb.); Casks (800 lb.).

Sodium Tungstate: $Na_2WO_4 \cdot 2H_2O$. Mol. wt. 329.95. Sp. gr. 3.23. M. P. 698°C. Colorless rhombic crystals. Loses water of crystallization at 100°C. Insoluble in acids and in alcohol. Grades: Technical, C. P., C. P.-special. Containers: Bottles and Cartons (1, 5 lb.); Cans (25, 50 lb.); Boxes (25 lb.); Kegs (100 lb.).

Soluble Glass: See Sodium Silicate.

Soluble Starch: See Starch, Soluble.

Solvent Naptha: See Naptha, Solvent.

Sorrel Salt: See Potassium Binoxalate.

Spanish White: See Bismuth Subnitrate.

Spirits, Columbian: See Methyl Alcohol.

Spirits, Motor: See Gasoline.

Spirits of Niter, Sweet: Alcoholic solution of ethyl nitrite containing not less than 3½% nor more than 4½% ethyl nitrite (C_2H_5ONO). Clear, mobile liquid with pale yellow or faintly greenish yellow tint. Sp. gr. not more than 0.823 at 25°C. Fragrant, ethereal odor. Volatile and inflammable. Decomposes on exposure to air. Grades: U. S. P. Containers: Bottles (¼, 1 pint, 1 gallon).

Spirits of Nitre: See Nitric Acid.

Spirits of Wine: See Ethyl Alcohol.

Spirits, Wood: See Methyl Alcohol.

Stannic Chloride: $SnCl_4 \cdot 5H_2O$. Mol. wt. 350.61. Also known as Tin Tetrachloride, Butter of Tin. Monoclinic crystals. Soluble in water. Grades: Technical, C. P. Containers: Glass Stoppered Bottles (1, 5 lb.).

Stannic Chloride, Anhydrous: $SnCl_4$. Mol. wt. 260.53. Sp. gr. 2.232. M. P. 33°C. B. P. 114°C. Also known as Fuming Tin Chloride, Fuming Stannic Chloride. Colorless, fuming liquid. Absorbs water to form Stannic Chloride crystals. Soluble in cold water. Decomposes in hot water. Soluble in alcohol. Grades: Technical, C. P. Containers: Glass Stoppered Bottles (1, 5 lb.); Drums (560, 1,000 lb.).

Stannic Chloride, Fuming: See Stannic Chloride, Anhydrous.

Stannic Oxide: SnO_2. Mol. wt. 150.70. Sp. gr. 6.95. M. P. 1127°C. with decomposition. Also known as Tin Flowers, Jewelers' Putty, Tin Ash. White tetragonal crystals, gray or white powder. Insoluble in water. Insoluble in dilute acids. Decomposes in alkalies. Grades: Technical, C. P. Containers: Bottles (1, 5 lb.); Cans (10, 25, 50 lb.); Kegs (100, 112 lb.); Drums (225 lb.); Barrels (500 lb.).

Stannic Sulfide: SnS_2. Mol. wt. 182.82. Sp. gr. 4.5. Also known as Mosaic Gold. Golden yellow hexagonal crystals or amorphous mass. Decomposes when heated to red heat. Insoluble in water. Insoluble in hydrochloric acid and in nitric acid. Soluble in aqua regia, in alkali hydroxides, in alkali sulfides. Grades: Technical, Purified. Containers: Bottles (¼, 1 lb.); Boxes.

Stannous Chloride: $SnCl_2 \cdot 2H_2O$. Mol. wt. 225.65. Sp. gr. 2.71. M. P. 37.7°C. Also known as Tin Crystals, Tin Bichloride, Tin Salt, Tin Protochloride. Monoclinic white crystals and crystalline mass. Decomposes at high temperatures. Solubility, 119 at 20°C. with decomposition. Infinitely soluble in hot water with decomposition. Soluble in alcohol, glacial acetic acid, alkalies. Grades: Technical, Recrystallized, C. P. Containers: Bottles (1, 5 lb.); Cans (1, 5, 25 lb.); Kegs and Drums (100 lb.); Barrels (500, 800 lb.).

Stannous Chloride, Anhydrous: $SnCl_2$. Mol. wt. 189.61. M. P. 246°C. B. P. 623°C. Also known as Fused Tin Crystals, Fused Tin Salt, Fused Tin Bichloride. Rhombic white crystals and crystalline mass. Solubility, 84 at 0°C. and 270 at 15°C. with decomposition. Soluble in ether, alcohol, acetone. Grades: Technical. Containers: Bottles (1, 5 lb.); Kegs and Drums (100 lb.).

Stannous Oxalate: SnC_2O_4. Mol. wt. 206.72. Sp. gr. 3.56. White crystalline or heavy white powder. Decomposes in hydrochloric acid. Slightly soluble in ammonium chloride and in ammonium oxalate solutions. Grades: Technical, Purified, C. P. Containers: Bottles (1, 5 lb.); Kegs (100 lb.).

Stannous Oxide: SnO. Mol. wt. 134.7. Sp. gr. 6.45. Also known as Tin Oxide, Tin Protoxide. Brownish black powder. Decomposes when heated to 700°-950°C. Insoluble in water. Decomposes in acids. Slightly soluble in ammonium chloride solution. Grades: Technical, C. P. Containers: Bottles (1, 5 lb.); Kegs (100, 112 lb.); Barrels (500 lb.).

Stannous Sulfate: $SnSO_4$. Mol. wt. 214.76. Also known as Tin Sulfate. Yellowish white crystalline powder. Decomposes when heated to 360°. Solubility, 19 at 20°C. and 18.2 at 100°C. Soluble in sulfuric acid solutions. Grades: Technical, C. P. Containers: Bottles (1, 5 lb.); Kegs (1 lb.).

Starch: $(C_6H_{10}O_5)_x$. Mol. wt. (162.14). Sp. gr. 1.50. Amorphous white powder. Decomposes when heated. Insoluble in water, alcohol or ether. Jelly formed with hot water. Grades: Technical, Laundry, Edible, U. S. P. Containers: Cartons (1, 5 lb.); Bags (140, 200, 280 lb.); Barrels (275 lb.).

Starch, Soluble: Starch, q. v. which has been treated with glycerine and alcohol. White powder soluble in water. Grades: Technical, Purified, C. P. Containers: Bottles, Cartons and Tins (1, 5 lb.); Boxes (25 lb.).

Starch Syrup: See Glucose.

Stearic Acid: $CH_3(CH_2)_{16}COOH$. Mol. wt. 284.468. Sp. gr. 0.847. M. P. 69.4°C. B. P. 383°C. Also known as Cetylacetic Acid, Octadecanoic Acid, n-Octadecylic Acid. Colorless, monoclinic leafy crystals and waxy blocks, powder or lumps. Insoluble in water. Slightly soluble in alcohol. Very soluble in ether. Soluble in chloroform, carbon disulfide, carbon tetrachloride. Grades: Distilled, single, double and triple pressed, Purified by Alcohol, U. S. P., C. P. Containers: Cartons and Cans (1, 5 lb.); Cartons (25, 5 lb.); Kegs, Drums, Cases (100 lb.); Barrels (100, 175, 200 lb.); Bags (100, 200 lb.).

Stearin: $(C_{17}H_{35}COO)_3C_3H_5$. Mol. wt. 891.450. Sp. gr. 0.862. M. P. 71°. Also known as Glycerol Stearate, Tristearin, Glycerol Tristearate. White powder or colorless crystals. Insoluble in water. Very slightly soluble in alcohol. Soluble in ether. Grades: Technical. Containers: Bottles (1 lb.); Barrels (300 lb.).

Abbreviations: Mol. wt. = Molecular Weight; Sp. gr. = Specific Gravity; M. P. = Melting Point; B. P. = Boiling Point; Solubility figures, where given, are parts by weight in 100 parts of water; Technical = Grade usually used for industrial purposes; Purified or Pure = Better grade than Technical; U. S. P. = Conforms to standards of U. S. Pharmacopoeia; C. P. = Chemically pure, exceeding requirements of the U. S. P.; N. F. = Meets requirements of the National Formulary.

Patents

Pickling Stainless Steel

U. S. Pat. 2,337,062. F. H. Page, Jr., assignor to Solar Aircraft Co., Dec. 21, 1943. A pickling solution for removing scale from stainless steels, comprising a water solution containing, by volume: from 3 to 30% of a mineral acid selected from the group consisting of sulfuric acid and phosphoric acid; from 4 to 30% nitric acid; and from 1 to 2% hydrofluoric acid.

Example:

	By Volume
Sulfuric acid	7-10%
Nitric acid	12-15%
50-60% Hydrofluoric acid	1.5- 2%

Air is bubbled through the pickling solution to maintain the nitrate ion.

Corrosion Prevention of Aluminum

U. S. Pat. 2,337,940. R. Shawcross, assignor to Aluminum Co. of America, Dec. 28, 1943. In a method of producing a hard, adherent and adsorptive oxide coating on aluminum articles, the step comprising treating said articles in an aqueous bath containing in solution about 0.25 to 20 per cent by weight alkali metal carbonate, together with an alkali metal-chrome glucosate, the weight of said glucosate being about 0.05 to 0.5 that of said alkali metal carbonate.

Example:

Sodium carbonate	2% by weight
Sodium-chrome glucosate	0.5% "

This solution is worked for about 30 minutes at 90°C. with scrap aluminum in order to stabilize it. Articles to be treated are immersed for about 20 minutes.

Sodium-chrome glucosate is prepared by interacting 139 grams of sodium-chromate (decahydrate) with 50 grams of saponin.

Electropolishing Steel

U. S. Pat. 2,338,321. C. L. Faust, assignor to Battelle Memorial Institute, Jan. 4, 1944. The method of electropolishing steel selected from the group consisting of plain carbon and low alloy steels, which comprises making the steel the anode in an aqueous solution of from 5 to 80% of sulfuric acid by weight of said solution, from 5 to 80% of phosphoric acid by weight of said solution and from 0.5 to 20% of chromic acid by weight of said solution, the combined acid concentration being above 50% but not over 90% by weight of said solution, the balance being essentially water, and passing therethrough an electric current of a density between 50 and 1000 amperes per square foot.

Example:

	1	2	3
Sulfuric acid	15%	20%	20%
Phosphoric acid	63%	67%	67%
Chromic acid	10%	4%	2%
Water	12%	9%	11%
Temp.	50°C.	50°C.	50°C.
C.D. (amp./sq. ft.)	100-400	100-400	250
Time (minutes)	20-90	20-90	30

Formula 1 is for polishing low carbon steel. Formula 2 is for high carbon steel and Formula 3 is for molybdenum steel (0.5%), 5% chromium steel and copper steel (less than 0.25% copper).

Bright Nickel Bath

U. S. Pat. 2,338,529. H. C. Mougey and R. J. Wirshing, assignors to General Motors Corp., Jan. 4, 1944. An electrodeposited combination of nickel and selenium the latter being present in relatively small proportion.

An electrolyte for electrodeposition of nickel containing an aqueous solution of nickel salts and an addition agent soluble in the electrolyte containing selenium in sufficient quantity to cause deposition of the nickel in brilliant form.

Example: (Sulfate Bath)

Nickel sulfate	250 g./L.
Nickel chloride	30 "
Boric acid	30 "
Selenious oxide	0.2-0.3 "

pH: 1.5-5.5
Temp.: 110°F.
C.D.: 24-48 amp./sq. ft.

Example: (For Die Castings)

Nickel sulfate	10-12 oz./gal.
Sodium sulfate	9-11 "
Ammonium chloride	2 "
Boric acid	3 "
Selenious oxide	0.025-0.05 "

pH: 5.8
Temp.: 110°F.
C.D.: 24-48 amp./sq. ft.

Corrosion Prevention of Magnesium

U. S. Pat. 2,338,924. J. Frasch (France), vested in the Alien Property Custodian, Jan. 11, 1944. A process for producing on magnesium-base metals coatings resistant to corrosion containing an oxide of chromium substantially uncontaminated by any other metal, in which the metal to be protected is electrolytically treated at normal temperature with an alternating current of a voltage between 2 and 10 in a bath containing chromic acid, the pH of the bath being below 2.

Objects in magnesium and magnesium-base alloys whenever covered with a blackish brown protective coating which contains an oxide of chromium substantially uncontaminated by any other metal.

Example:

Chromic acid	300 g./L.
Sulfuric acid	5 "

4 volts, 8 amp./sq. dm., room temp., 10 minutes.

Example:

Chromic acid	50 g./L.

8 volts, 4 amp./sq. dm., room temp., 15 minutes.

Tarnish Prevention

U. S. Pat. 2,339,200. F. J. Sowa, Jan. 11, 1944. A process for preventing the tarnishing of metals, comprising applying over the surface of the metal an aqueous solution of a film-forming hydrophilic colloid and a water-soluble wetting agent, and evaporating the solvent to deposit on the surface a thin continuous film of said colloid.

Example:

Glyceryl (mono) oleate
Glyceryl (mono) stearate
Ethylene glycol (mono) stearate
Diethylene glycol stearate

Electropolishing Aluminum

U. S. Pat. 2,339,806. A. N. D. Pullen (England), assignor, by mesne assignments to Aluminum Co. of America, Jan. 25, 1944. In a process for improving the reflectivity of aluminum or aluminum alloy surfaces and producing a surface with decreased prominence of structural and other markings, the step which comprises electrolytic brightening of said surface by subjecting it to direct current anodic treatment in an aqueous electrolyte containing about 3-20 per cent sodium carbonate together with about 0.5-5 per cent of an ammonium salt, said electrolytic having a pH value of at least about 10.

Example:

Sodium carbonate	15%
Trisodium phosphate	6%
Ammonium carbonate	1%

The article is immersed at 80°C. until uniform attack is observed. It is then made anode at 10-14 volts, the current density being 10-15 amp./sq. ft. At the end of about 20 seconds maximum the current density drops to half. Anodizing is continued for 10 minutes, after which the article is rinsed and dried. This treatment may be followed by the bisulfate bath treatment for production of a protective film (U. S. Pat. 2,096,309).

Filter

U. S. Pat. 2,341,414. G. J. Polivka, Feb. 8, 1944. In a filter, a cartridge comprising a set of thin, porous sheets of crepe papers arranged in vertical, superimposed, flat, close together relation, a second set of thin, porous sheets of crepe paper arranged in vertical, superimposed, flat, close together relation, a filtering cloth interposed between said two sets of sheets of crepe paper and in surface contact therewith, a layer of flat filtering cloth having surface contact with the lowermost sheet of said second set of crepe paper sheets, and other layers of textile material arranged in alternation with plural layers of flat, dense, adsorbent layers of paper progressing in number in each instance at each occurrence to the lower face of the cartridge, and means marginally interconnecting all of the said filter elements together and enveloping the same.

Vitreous Enamel

U. S. Pat. 2,341,242. J. E. Rosenberg, assignor to The O. Hommel Co., Feb. 8, 1944. In enamel-ware making a slip compounded of frit together with a clay that carries an addition of a substance that, stable within the temperature range that is realized in drying, at the firing temperature of the ware gives off gas.

Strip Plating Machine

U. S. Pat. 2,342,811. E. D. Martin, assignor to Inland Steel Co., Feb. 29, 1944. In an apparatus for electroplating a metal strip by passing the strip through an electrolytic bath, the combination with a plurality of insulated upper rolls, the strip passing over and about the upper rolls above said bath with portions of said strip extending down between said upper rolls and through said bath, of a plurality of band-engaging rolls above said bath at least one of which extends between adjacent upper insulated rolls and at least one of which is conducting and electrically charged, and a flexible conducting band passing around said band-engaging rolls and above said upper insulated rolls, the band engaging the upper surface of said strip as it passes over said upper insulated rolls to electrically charge said strip.

Strip Plating Machine

U. S. Pat. 2,342,850. J. F. Ferm, assignor to Crucible Steel Co. of America, Feb. 29, 1944. In an apparatus for feeding continuous strip material through successive plating zones, a first and a second pair of pinch rolls between which the strip is fed, said first mentioned pair of pinch rolls being interposed between successive plating zones and being located in advance of said second mentioned pair of pinch rolls, means applying a positive drive to said second roll pair, an overrunning clutch, an adjustable friction clutch and a second source of driving power, and means for driving said first roll pair from said second source through said friction and overrunning clutches.

Abrasive Blasting Machine

U. S. Pat. 2,344,476. D. C. Turnbull, assignor to The American Foundry Equipment Co., Mar. 14, 1944. In blast cleaning apparatus, a track, a carriage suspended from, and movable along, said track, a work-supporting spindle rotatably supported by said carriage, an odd number of equally spaced radially extending guide arms fixed to said spindle, a guide roller rotatably mounted on each of said arms, a substantially straight guide track extending along one side of the path of advance of said carriage adapted to provide a guide for a pair of adjoining rollers and preventing lateral movement of said spindle, a substantially straight guide track extending beyond and along the other side of the path of advance of said carriage adapted to provide a guide for another pair of adjoining rollers, and a stationary member positioned between the adjacent ends of said guide tracks for engaging the roller on one of said guide arms to rotate said spindle through a predetermined arc of less than 360°.

Abrasive Removing Apparatus

U. S. Pat. 2,343,357. H. R. Zimmerman, assignor to Pangborn Corp., Mar. 7, 1944. Apparatus for removing abrasive from the interior of hollow articles each having an opening in an end thereof comprising, a drum supported to revolve about its axis, a chordal compartment in said drum at one side of said axis and having an article receiving opening at one end of the drum and discharge opening at an opposite end of said drum, said compartment being formed with a relatively flat wall to receive an article from a position at an end of the drum when the drum is in loading position, and a second wall inclined relative to the first wall to effect discharge of the article from an opposite end of the drum when the drum has rotated about its axis to a position where the article is supported by said second wall.

Sheet Cleaning Machine

U. S. Pat. 2,343,532. M. A. Buckley, assignor to Carley Heater Co., Inc., Mar. 7, 1944. In a machine for cleaning plates, a frame, a track supported by the frame for supporting and conveying vertically disposed plates therethrough, a pair of vertically disposed rotatable brushes supported by the frame at each side of the track with the brushes of one pair closely adjacent the brushes of the other pair for operative engagement with opposed sides of the plates, a driving motor individual to each of the brushes supported by the frame above the track, and a reduction gear set supported by the frame and interposed between each brush and its individual motor, the motors being operatively connected with the brushes through the respective reduction gear sets for rotating all of the brushes in the same direction.

Protective Oil

U. S. Pat. 2,344,016. A. P. Anderson, assignor to Shell Development Co., Mar. 14, 1944. A corrosion-protective composition for metals comprising a normally non-gaseous hydrocarbon oil substantially free from asphalt and containing dissolved a small amount of a hydrocarbon wax amine substantially free from chlorine which amine is a reaction product of chlorinated paraffin wax and ammonia.

Strip Coating

U. S. Pat. 2,344,138. F. E. Drummond, assignor, by mesne assignments, to Chemical Developments Corp., Mar. 14, 1944. A method of coating long continuous lengths of metal stripping on only one side thereof comprising continuously moving and guiding the stripping through a liquid sealed chamber, circulating gaseous metal carbonyl over the upper surface only of said stripping and in a direction opposite to the movement of said stripping while protecting the underside of said stripping from contact with said gaseous metal carbonyl throughout its movement in said chamber, and heating said strip on its underside as it passes through said chamber to decompose said gaseous metal carbonyl and thereby precipitate and deposit the pu metal onto the upper surface only of sa stripping as it is moved therealong.

Abrasive Blasting Machine

U. S. Pat. 2,344,475. D. C. Turnbull, a signor to The American Foundry Equipme Co., Mar. 14, 1944. In blast cleaning a paratus including a blasting station, a wor supporting carrier, means for transporti said carrier along a predetermined path, sa work-supporting carrier including a carria portion, a work-supporting spindle, mea rotatably connecting said spindle to sa carriage, and a sprocket operatively co nected to said spindle, a continuous dri chain having an outer run and an inner r positioned along the path of travel of sa spindle sprocket, means for driving sa drive chain to rotate said work-supporti spindle during its advance movement, an means including a freely rotating conta disc positioned between the inner and out runs of said drive chain substantially in li with the blasting station to receive side thru exerted on the carrier at the blasting stati said disc being arranged to bulge the inn sprocket engaging run of said chain to fa cilitate engagement of said spindle sprock with said chain.

Hot Galvanizing Sheets

U. S. Pat. 2,345,058. E. A. Matteson, a signor to The Aetna-Standard Engineeri Co., Mar. 28, 1944. In the galvanizing metal sheets or strips, a process which in cludes the steps of passing a sheet or str into a bath of molten lead having a pool molten zinc floating thereon at a point re moved from the point of entry of the sheet strip into the lead bath, removing the she or strip from the bath through the pool zinc, and removing dross from the lead-zi level of the bath by causing the dross move in a horizontal direction general parallel to and on both of the side surfac of the sheet or strip as it passes through sa lead-zinc level.

Abrasive Blasting

U. S. Pat. 2,344,989. W. L. Keefer, a signor to Pangborn Corp., Mar. 28, 19 In abrading apparatus, a rotor including plurality of propeller blades extending wardly short of the axis of the rotor, impeller mounted between inner ends of sa propeller blades rotating with said rotor plurality of circumferentially spaced van carried by the impeller, a circumferential extending ledge carried by each vane te minating short of an adjacent vane, mea for feeding abrasive over the peripheral edg of said vanes, stationary means substantia closing the free end of said impeller a said rotor, said closure means having an op ing therethrough at the axis of the ro whereby a current of air is drawn throu said opening by the rotating propeller blad and the rotating impeller vanes, and mea within the impeller for confining the rad outward movement of the air current thro spaces between the impeller vanes adjac the point where the abrasive is supplied the impeller.

TIME AND MONEY SAVING PRODUCTS FOR PREPARING ALUMINUM FOR PAINTING AND ANODIZING

DEVELOPED BY DIVERSEY

HELP WANTED!

Here's one "help wanted" problem that's easily solved . . . even in these days of man-power shortages. If it's a problem in metal cleaning and working . . . the Diversey D-Man is always on deck to lend a helping hand. Backed by a Research Laboratory that has spent 18 years developing special purpose products, the Diversey D-Man can often show you ways to step-up production that require less manpower.

Simple Cleaning—For cleaning aluminum prior to painting or anodizing, the Diversey Research Laboratories have made available four different products, each with specific properties to meet varying requirements and conditions. They include Diversey Aluminum Cleaner, S S Aluminum Cleaner, Diversey D-C No. 36 and D-C No. 38.

At the moment Diversey D-C No. 36 is perhaps the most popular. Recently markings on aluminum sheets have been changed and these new markings have been quite a problem with ordinary cleaners. D-C No. 36 not only removes such markings completely but does the job in about one-fifth the time ordinarily required.

Anodizing—Electrolytic Process—Prior to anodizing by the electrolytic process, aluminum must be thoroughly cleaned. For this purpose, the four products mentioned above are recommended. In each, powerful cleaning action is supported by unusual wetting and emulsifying properties which quickly and completely removes oil and grease. At the same time, special inhibitors prevent pitting, staining or discoloring of the aluminum surface.

Anodizing—Non-Electrolytic Process—In this process, pre-cleaning is also essential. For this purpose, D-C No. 36 is particularly recommended because of its unusually effective free-rinsing action. It leaves no film on the surface to interfere with the subsequent successful completion of the operation. For further details write Metal Industries Department.

THE DIVERSEY CORPORATION
53 W. Jackson Blvd., Chicago 4, Ill.

SHOP PROBLEMS

PLATING AND FINISHIN
POLISHING — BUFFIN
CLEANING — PICKLIN
HOT DIP FINISHE

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Nickel Rash

Question: I have been working with nickel plating solutions. As a consequence I have had a nickel rash for the past few months. I should appreciate your sending me all available information on the treatment of nickel rash.

If you do not have this desired information, would you please direct me as to where I may obtain this information.

H. Y.

Answer: If sensitive to nickel solution, it will be necessary to take extreme precautions to avoid contact with it.

An old treatment which has appeared in the literature a number of times may be tried. The treatment consists of bathing the hand for 15 minutes in a solution made up as follows:

Sodium bicarbonate	4 oz.
Potassium chlorate	2 "
Sodium borate	2 "

Dissolve 1 tablespoonful of the above mixture in 2 quarts of water for use. The temperature should be as high as can be withstood.

After this treatment the hands are dried with a warm towel without rubbing. The following ointment is then applied.

Lanolin	4 oz.
Sterile Olive Oil	1 "
Thymol Iodine	1 dr.
Starch	Q.S.

Accurate Measurement

Question: We would appreciate receiving information regarding available equipment for the accurate measurement (within .0002") of silver plating on copper bus bars.

The variation in thickness of the bus bars may be several thousandths of an inch from end to end, so that overall micrometer readings are impractical. Also, variations in hardness of both the copper and silver might cause deviation in measurements based on the bounce of a steel ball or other similar mechanical testing methods.

Another basic requirement of the testing method is that it shall not destroy the silver plate where the measuring device is used.

N. R. B., Inc.

Answer: We know of no method for testing this combination which is non-destructive to the deposit.

Scum on Acid Strip

Question: In stripping some zinc plated bimetals we notice a black scum coming to the surface of the 1 to 1 Hydrochloric Acid bath. Could you tell us what the nature of this black scum might be?

We have stripped other lots without encountering this black scum so we wonder if there is something in the plate which was not there before.

W. S. CORP.

Answer: If the zinc deposit is of the bright zinc type, it is possible that the black scum consists of organic and metallic brighteners insoluble in the acid. The scum may also be carbides from the surface of the basis metal, if steel.

Insulating Heating Coils

Question: I have a problem on insulating heating coils from plating tanks.

At present we are using hi-pressure steam hose between a steam supply and coil. These however, last such a short time that I am inquiring as to whether there is some suitable insulated connector on the market or other means or methods of insulating said coil.

This information will be greatly appreciated.

A. M. P., INC.

Answer: We would suggest that instead of using steam hose you purchase standard pipe insulators which are obtainable from any of the local plating supply houses.

Tungsten Plating

Question: Have you any literature on tungsten plating

M. W. M.

Answer: We would advise that tungsten has never been plated in pure form, but a number of alloys of tungsten and various metals have been deposited experimentally. One of the most successful of these is the fluoride bath of Armstrong & Menefee, (U. S. Patents 2,145,241; 2,145,745; 2-160,-321; German Patent 654,270).

A number of papers have been presented before The Electrochemical Society by Fink, Holt and others. We suggest that you examine the transactions of the Society for the details which are too numerous to give here.

Plating 14K Gold

Question: We are interested in procuri a formula for a plating salution that w plate a 14K gold color to match the color the enclosed sample ring. Can you help us a solution of this problem?

F.H.N. & CO.

Answer: There are three different shad of gold on these samples, but we can of the following formula for trial:

Color variations may be obtained by chan ing the amounts of both nickel and copp cyanide.

Water	1 gal.
Sodium cyanide	2 oz.
Sodium gold cyanide	½ oz.
Nickel cyanide	1/10 to 2/10
Copper cyanide	1/30 oz.
Sodium carbonate	¼ oz.
Temperature	140°
Voltage	3 to 5

Stainless steel anodes

Metal Sputtering

Question: We are very much interested securing information on sputtering of meta on crystal and plastic surfaces. Could y supply us with a bibliography of pertine information, and could you also advise what companies are making sputtering m chines? Also, what firm might we cons on this process in the Eastern area?

C.R.LAB.INC.

Answer: Apparatus for metal sputtering obtainable from the Central Scientific Co pany, 79 Amherst Street, Cambridge 42, Ma In this company's Cenco News of May, 19 is a list of references on the subject to th date. They may also have further referenc which they may furnish on request.

Copper Plating

Question: Would it be possible for you give me some information on copper pla ing before heat treating as we are havi a little trouble due to some copper bei stripped off and some left on during ca burizing. I apply a 40 minute copper pla

A. P. WORKS

Answer: For a case depth of 0.01" it b been generally found advisable to apply deposit of 0.0005" of copper and for deep hardening 0.001" is suggested. The thickne of the copper deposit is not as important absence of porosity so that with a filter solution thinner copper deposits may employed.

The trouble being experienced may be d to insufficient copper or to improper prepa tion of the work for plating. We would su gest that you investigate these two pos bilities.

PUT *Beckman* pH CONTROL TO WORK IN *YOUR* PLANT

1. INCREASING PLATING SPEEDS
2. REDUCING COSTLY "REJECTS"
3. PRODUCING SMOOTHER COATINGS
4. IMPROVING PLATING EFFICIENCIES

By Beckman-controlling the pH of your plating processes you can make FOUR important savings in your plant operations . . . *vital* savings that mean higher quality platings at substantially lower operating costs . . .

1. By closely controlling the pH of your plating baths you can generally operate at higher current densities without risk of faulty coatings. This means faster plating, reduced costs. *And remember—Beckman is the only pH equipment that will accurately control alkaline plating operations such as cadmium, zinc, brass, etc.!*

2. The controlled-coatings produced by Beckman-regulated plating baths minimize blistering, peeling and off-color deposits, thus greatly reducing "rejects" and costly waste of time and materials.

3. Not only are blistering and peeling practically eliminated, but Beckman-controlled coatings are far more uniform and smoother, insuring highest quality platings on run after run.

4. And because Beckman-controlled plating processes are simple to handle and uniformly effective at all times, even inexperienced plant workers can turn out consistently top-quality plating jobs with minimum loss. Over-all plant efficiencies are greatly increased!

LET US HELP YOU take full advantage of the multiple savings possible through Beckman pH Control. Our engineering staff will gladly make recommendations to fit your particular requirements.

NATIONAL TECHNICAL LABORATORIES
SOUTH PASADENA • CALIFORNIA

WORLD'S LARGEST MANUFACTURER OF GLASS ELECTRODE pH EQUIPMENT

The Beckman Automatic pH indicator is the most advanced pH instrument available today. Incorporates many unique features found in no other make or type of equipment. Operates standard control and recording equipment. Ask for Bulletin 16!

The Beckman Industrial pH Meter is ideal for portable plant and field use. Simple, quick, accurate. May be used with Beckman Flow Type and Immersion Type Electrode Assemblies for maintaining pH check on solutions in process. Ask for Bulletin 21!

SEND FOR YOUR COPY OF THESE HELPFUL BECKMAN BOOKLETS!

"What Every Executive Should Know About pH"— a simple, non-technical discussion of what pH is, how it's used, and its importance to modern industrial operations.

Bulletin 86—The most complete catalog available on modern pH equipment. Lists and describes over 60 different electrodes together with accessory equipment for all types of applications.

***Beckman* THE LEADING NAME IN pH**

NEW EQUIPMENT AND SUPPLIES

NEW PROCESSES, MATERIALS AND EQUIPMENT FOR THE METAL INDUSTRY

Presto Polishing Wheel Bushing

The Manderscheid Co., Dept. MF., 605 West Washington St., Chicago, Ill. announce a new polishing wheel bushing, light in weight and easily inserted. PRESTO bushings eliminate eccentricity of the wheel, spindle wear and danger to the polisher, since it is not necessary to spin the polishing lathe spindle in order to mount the wheel. The bushings are inserted by reversing the flanges and using the spindle as a screw press. Notches in the bushings prevent them from coming out or turning in the wheel. Polishing wheels should be ordered bored exactly the same diameter as the spindle. All bushings are made of 16 gage drawn steel to supply strength and to prevent warping.

PRESTO bushings come in standard spindle sizes as follows:

1", 1¼", 1½", 1¾" and 2" diameter. all with an inside tolerance of plus 0.003" so that in the case of a bushing that is to fit on a 1¼" spindle, the inside dimensions of the bushing is 1¼" diameter plus 0.003", or 1.253".

New Iron Cement

So-Lo Works, Dept. MF, Loveland, Ohio, producers of a complete line of industrial cements and adhesives, announce a new product, "Fix-Iron", said to be unusually effective for repairing broken, cracked, or defective metal castings, piping, etc., making joints, seams, and loose parts secure, and stopping leaks in boilers, furnaces, fire-pots, and other metal equipment.

"Fix-Iron" is in powder form, and mixed with water as used. No heat is required. It is quickly and easily applied with a putty knife or similar tool and may be hammered into cracked or broken parts. It rapidly hardens like iron. After metallizing, "Fix-Iron" possesses the same expansion and contraction properties as iron itself, thus assuring a permanently tight joint regardless of temperature changes.

"Fix-Iron" can be used on iron, steel, brass, and other metals, also on wood, with equal success. It is sold in convenient packages and is economically priced. The new product is fully guaranteed and backed by So-Lo Works' many years of experience in the production and distribution of high quality, dependable cements and adhesives for both industrial and household use. "Fix-Iron" is available without priorities in 1 lb. and 5 lb. cans; 25 lb. and 100 lb. kegs through mill supplies and hardware jobbers. Household sizes in 1¾ and 7 ounce glass jars.

Rectifier

The "SELCO" line of power rectifiers is announced by Selenium Corporation of America, Dept. MF., 1800-04 West Pico Boulevard, Los Angeles 6, California.

Seven disc sizes ranging from ¾" to 4½" in diameter are available.

All the units are stated to be moisture proof and to have permanent characteristics.

Assemblies with output up to 1000 amperes can be supplied.

Rectifiers are of the selenium type and are claimed to offer the advantages of high efficiency, high overload factor, unlimited life, maximum output per unit weight and advantageous temperature characteristics.

Selco rectifiers are available for bolt or stud mounting direct to equipment or with mounting brackets as per specifications.

Two Finger Gloves

This new "two-finger" open back work handler is said to be most efficient as general purpose hand protection.

Designed recently for one of its customers by Industrial Gloves Company, Dept. MF, Danville, Illinois, the hand pad is made of chrome tanned cowhide split leather. It carries a double thickness wearing surface across the entire palm and over the side and back of the fore finger where so much severe wear comes. All seams are sewed with steel thread making the guard practically rip proof.

The open back construction means a cool, comfortable, flexible fit. An adjustable fastener at the wrist is another added feature for comfort to the wearer.

Lead Fluoborate Solutions

Of interest in the expanding field of lead electroplating are the lead fluoborate solutions being offered by the Special Chemicals Division of Pennsylvania Salt Manufacturing Company, Dept. MF, Philadelphia, Penna., under the trade names "Pennsalt LF 42" and "LF 50." Available in 42% and 50% Pb $(BF_4)_2$ concentrations, these solutions are stabilized with excess fluoboric (HBF_4) and boric (H_3BO_3) acids in balanced percentages. For use, they are diluted with water to the

Professional Directory

desired concentration. Electroplating baths prepared from these solutions are stable, give a smooth, fine-grained, dense deposit with a cathode current efficiency of essentially 100%, and permit plating directly on steel. Corrosion resistant surfaces so produced replace critical metals, such as cadmium, zinc, chromium, copper and nickel. Available in commercial quantities, in glass carboys.

Glue Heater

The Cabinet Type Thermo-Electric Glue Heater illustrated is a new model recently announced by Divine Brothers Company, Dept. MF, Utica, New York.

The heater may be obtained with 4, 6 or 8 pots; each pot has an individual cover which keeps the glue clean and also keeps the water tank hot when the pots are removed. Thermostat reliably maintains temperature setting at all times. The cabinet is a very convenient storage space for glue and water dippers. The control switches and thermostat are totally enclosed, protected from possible damage by plant traffic.

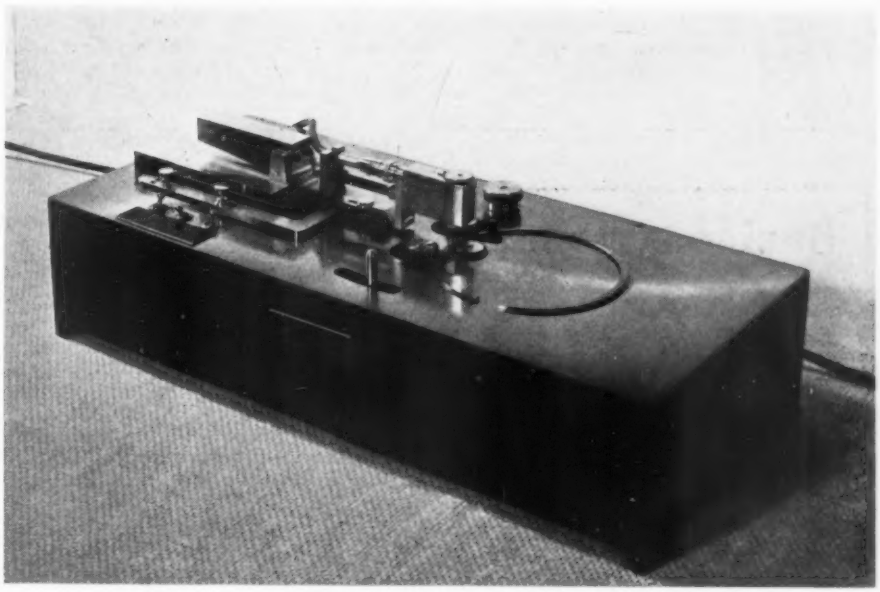
Further information may be obtained by writing to the company.

Profilometer

The surface-roughness measurement of piston rings is aided by introduction of a new piloting fixture by Physicists Research Co., makers of the Profilometer. The side surfaces of all types of rings, including keystone rings, may be measured with the Type R Fixture, which works in conjunction with any Profilometer.

The ring may be measured in three ways: by tracing circumferentially; by tracing radially at one place on the ring; and by a combination of both at the same time. Operation is wholly automatic, with switches provided for selection of the type of stroke desired. An automatic shut-off is provided to stop rotation of the ring as the gap approaches the diamond point, where damage might occur.

The Type R Fixture weighs 95 pounds and measures 10" x 22" x 7½". Operation is from 115-volt, 60-cycle power lines. Further information and specifications may be had from Physicists Research Co., Dept. MF, 343 S. Main St., Ann Arbor, Mich.



Business Items

Claude S. Speicher, who joined the Somers Brass Company in 1929 as manager of sales and general manager, has been elected treasurer of the company succeeding the late *Joseph E. Somers*. Mr. Speicher resigned as secretary upon assuming the responsibilities of treasurer. He still retains the office of vice-president.

Starting in the brass business in 1918 as an office boy with the U. T. Hungerford Brass & Copper Company, Mr. Speicher later served in the cashier's and treasurer's departments of that company, and later became head of the Monel Metal and Nickel Sales Department. In 1928, he resigned to become New York sales manager of the American Mond Nickel Company, holding that post until the company was merged with The International Nickel Company.

The Somers Brass Company was established in 1910 and specializes in rolling thin gauge non-ferrous metal strip lighter than 0.015″ in thickness.

Mr. Speicher will still maintain his office at 350 Madison Avenue, New York City.

The *Magnus Chemical Company, Inc.*, Garwood, New Jersey, manufacturers of industrial cleaning materials, announces the appointment of *Avery H. Stanton* as Technical Engineering Consultant.

Mr. Stanton, a graduate of the Massachusetts Institute of Technology, was formerly with the War Production Board at Washington, D. C.

He is well known to the Pulp and Paper Industry, having been actively associated with this industry for a number of years prior to serving in Washington.

The major portion of Mr. Stanton's activities in his new position will be devoted to Government Agencies and the Pulp and Paper Industry in regard to Industrial Cleaning and Process Control Compounds.

Al J. McCullough and *Jack E. MacConville* have been placed in joint charge of industrial instrument sales for the *Brown Instrument* division of the *Minneapolis-Honeywell Regulator Co.* at its Cleveland, Ohio, office.

Mr. McCullough has been with the Cleveland branch for the past eight years. Mr. MacConville has been with the Brown division for the past 15 years, most of this period having been spent in the sales department at the Philadelphia home plant of the Brown organization. Both appointments became effective April 1st.

Kentner L. Wilson has been named branch manager of the *Minneapolis-Honeywell Regulator Co.* Detroit office. His appointment became effective April 1st.

Mr. Wilson started with Minneapolis-Honeywell at its Minneapolis plant in 1931. When the Brown Instrument Co. became a part of the company, Mr. Wilson was transferred to the Brown division at Philadelphia where he spent three years. Following this he was named industrial manager in charge of Brown Instrument sales at Indianapolis, Ind., and for the past three years he has been industrial manager of the Brown division of Minneapolis-Honeywell at Cleveland, Ohio.

Dr. V. N. Krivobok, recognized authority on stainless steel and former Professor of Metallurgy at the Carnegie Institute of Technology for many years, has become associated with the Development and Research Division of *The International Nickel Company* at New York, *Robert C. Stanley*, President, announces.

Dr. Krivobok's services will be utilized mainly in the development of markets for alloy and stainless steels and to assist steel manufacturers in expanding markets for their post-war products.

Residing at present in Glendale, California, Dr. Krivobok had until recently been Chief Metallurgist of the Lockheed Aircraft Corporation at Burbank. Before joining Lockheed in January, 1941 he had been Professor of Metallurgy at Carnegie Institute of Technology since 1924 while also serving as Associate Director of Research for the Allegheny Ludlum Steel Corporation (1934-1940). From 1924 to 1934 he had been Consulting Metallurgist to several steel companies.

A graduate of Harvard Engineering School, Dr. Krivobok's many papers on stainless steels and other steel alloys have been widely published. One of his best known papers, "Alloys of Iron and Chromium" he presented in October 1934 as the ninth Edward de Mille Campbell memorial lecturer for the American Society for Metals.

Dr. Krivobok is a member of the American Society for Metals, British Institute of Metals, American Institute of Mining & Metallurgical Engineers, American Society for Testing Materials and the Russian Metallurgy Society.

John M. Smith, General Manager of Manufacturing for the *RCA-Victor Division of Radio Corporation of America*, has resigned to join *P. R. Mallory & Co., Inc.*, Indianapolis, Ind., as Vice-President in Charge of Manufacturing.

Mr. Smith has been associated with the Radio Corporation of America for the past fourteen years. Prior to that time he was engaged for sixteen years in manufacturing activities with the *Incandescent Lamp Division* of the *General Electric Co.*, Nela Park, Cleveland.

Sumner Simpson, President of *Raybestos-Manhattan, Inc.*, recently announced the election of *Harry E. Smith*, General Manager of The Manhattan Rubber Mfg. Division, Passaic, N. J., and *Robert B. Davis*, General Manager of The Raybestos Division, Stratford, Conn., as Vice-Presidents of Raybestos-Manhattan, Inc., at a meeting of directors of the corporation in New York on April 4th. Both Mr. Smith and Mr. Davis are members of the Board of Directors.

Stockholders, at their annual meeting preceding the directors' meeting, re-elected all directors of the corporation. Officers of Raybestos-Manhattan, Inc., headed by Mr. Simpson, President, were also re-elected, Mr. Smith and Mr. Davis being additions to the staff of officers.

At a recent meeting of the Board of Directors of the *C. J. Tagliabue Manufacturing Company*, Brooklyn, N. Y., *Mr. A. F. Rucks* was elected President and General Manager. He succeeds the late *C. D. Waters*.

Mr. Rucks has been associated with the company for over thirty years, during which time he has held a number of important positions in the organization. At the same meeting, *Mr. J. T. Kittcamp*, Vice President of the *Johns Manville Products Corporation* was elected to the Board of Directors of the company.

The company is a prominent manufacturer of thermometers, oil testing instruments, potentiometers, moisture testers and instruments for recording and controlling temperature and pressure.

The *Pemco Corporation* of Baltimore has announced a number of changes in their personnel.

R. L. Foraker has joined their sales staff and will cover the Chicago territory which includes Illinois, Indiana, Michigan, and Wisconsin. Ralph joined the Pemco Corporation as of January 1, 1944. He is well known in the Chicago area having spent some twenty-two years in the porcelain enamel industry, most of which has been with Chicago companies.

Pemco also announces the advancement of *O. L. Davis* from Purchasing Agent to Assistant Works Manager. Mr. Davis is a graduate of Ohio State University and has held positions with the Western Electric, Chicago Acme Steel, and the Airtract Corporation. He joined the Pemco Corporation in 1943 as Purchasing Agent.

Mr. James Theodore has been advanced to the position of Buyer. Mr. Theodore has been with the Pemco Corporation for a number of years.

Pennsylvania Salt Manufacturing Company announces the following additions to its Research and Development Department Staff:

Dr. R. D. Evans, formerly with New Jersey Zinc Company; *Mr. E. A. Bruce* of Blaw-Knox Company; *Mr. F. W. Jakob*, recently discharged from the U. S. Army as 1st lieutenant and graduate of Pennsylvania Military College; *Mr. J. L. Staubly* of National Association of Dyers and Cleaners; *Mr. J. M. Swales* of U. S. Navy Inspection Department; *Mr. J. J. McBride* of Franklin Research Company; *Miss Katherine Dilworth* of Delaware County Hospital; and *Miss Gertrude Schutze* of National Broadcasting Corporation.

New staff members also include *Miss Margaretta E. Aeugle* of Duke University and *Miss Gladys Molyneux* of Cornell University.

Mr. Thomas Toovey, well-known pulp and paper specialist, has been transferred from Sales Service to the Research and Development Department.

Bernard J. Conway, for twelve years connected with the Proctor Electric Company of Philadelphia, has recently become a member of the engineering and service staff of the Udylite Corporation.

Mr. Conway's experience as manager of the buffing and polishing division and later as head of all metal finishing operations at the Proctor Company especially qualifies him for his new work.

He will be located in the New York office and will be in charge of the territory comprised of all southeastern Pennsylvania and southern New Jersey. His headquarters will be Philadelphia where he has many friends in the metal finishing industry.

The Cowles Detergent Company, Cleveland, Ohio, manufacturers of metal cleaners and industrial alkalies, announce the appointment of *Norman E. Garman* as Cowles Technical Engineer for the Chicago territory. Mr. Garman is an experienced Process Metallurgist and well equipped with education and experience to render expert service on all kinds of metal cleaning problems.

Harry [illegible]rnard, of *Bernard Chemical Products* [illegible] Brooklyn, N. Y., announces a merger of [illegible] concern with *Atlantic Research Laboratories Corp.* with offices and laboratories locat[illegible] at 21 Washington Place, New York City [illegible] ective April 15, 1944.

This combine will conduct business in the name of Atlantic Research Laboratories Corp. of which Mr. Bernard will serve as president and general manager.

Harry Bernard established his business several years ago to manufacture industrial cleaning compounds and solvents, specializing in the formulation of metal cleaners for the plating and metal finishing trades.

Mr. Bernard was actively engaged in electroplating for many years and held positions with Bommer Bros., Brooklyn, N. Y., and the Sargent Co., New Haven, Conn., as superintendent of plating and finishing. Early in 1917 he accepted a position with Oakite Products, Inc., remaining with them for over 25 years, during which time he served as a division sales manager.

Harry Bernard was one of the first group of platers that met in the old Astor House in New York City to form the present *American Electroplaters' Society*, and later served as vice-president of the New York branch, after which term he transferred to the Rochester, N. Y., branch. During the 1920 A. E. S. Convention, held at Rochester, N. Y., he assumed the duties of chairman of program and publicity.

Having returned to Brooklyn, N. Y., during 1933 to accept a position as sales manager with *Magnuson Products Corp.*, Mr. Bernard again became a member of the New York branch, A. E. S., of which he is still a member.

Mr. *Oscar Harding*, who organized the Atlantic Research Laboratories Corp. a number of years ago and who has served as secretary and treasurer as well as technical research director since the beginning of this incorporation, will continue to serve in these capacities.

After receiving his degree of chemical engineer from the Royal University of Copenhagen, Denmark, Mr. Harding attended Oxford University, London, England, for several years for the further study and research in chemical fields.

News from California
By FRED A. HERR

Philip H. Clapp has been appointed Pacific Coast district manager for *Norton Co.* of Worcester, Mass., with headquarters at the offices of the *Ducommun Metals Co.*, Los Angeles. He has represented the Norton Co. in various capacities on the west coast since 1916.

Electron Equipment Corp. has moved its plant from Palm Springs, Calif., to 917 Meridian Ave., South Pasadena, for expanded production of technical electric industrial equipment, such as electronic motor controls, rectifiers, converters and inverters, cycle changers, heavy duty battery chargers, and voltage controls. *D. B. Clark* heads the firm as president.

Plating shop men who have been bothered with the aggravating "nickel itch" may find some pointers of value in the experience of *Joseph Sunderhaus*, plating foreman of *F. G. Olds & Son, Inc.*, Los Angeles, who has been cured of a bad case of the itch.

Sunderhaus stated that the eruption appeared on his elbows, lower arms and legs shortly after he had been doing some black nickeling. After more than a half dozen treatments in the form of exterior ointment applications by a competent dermatologist failed to produce results. He then called upon his regular doctor who eliminated the infection in short order by placing Sunderhaus on a restricted diet designed to remove acids from his condition. He was ordered to refrain from eating acid fruits, fried meats, etc., and confine himself to boiled vegetables. The hardest blow was the doctor's order to refrain from drinking buttermilk, Sunderhaus' favorite beverage. However, he reported, the diet eliminated the nickel itch, and he decided to pass the thought along to other platers through the medium of this column.

Kenneth T. Norris, president of the *Norris Stamping & Manufacturing Co.* of Los Angeles, which operates one of the largest automatic zinc plating setups in the country for use on shell cases, is chairman of the Los Angeles and Orange County Committee for Economic Development and on April 15 announced a six point program for relief of small business in the post-war period.

Norris' program advocated quick changeover to peacetime production for small firms, of which plating shops are an example; special consideration for them in war contract termination; local aid in financing; tax relief; an educational program in new industrial and merchandizing methods; and inducements to returning war veterans to enter business for themselves.

California plating shop operators, who have been plagued with manpower problems, received with satisfaction the announcement from Sacramento on April 8 that finishing of metal products had been included in a list of occupations certified as necessary to the war effort and applicable to draft-age men 26 years and over.

The occupations in which metal finishing was included apply to men placed in 2-A—activities in support of the war effort.

The manpower situation in respect to Southern California plating shops has been considerably aggravated since the subject was last commented upon in this column some ten months ago. Hiring of women continues at an increased pace and foremen are now assigning women to shop jobs as a routine matter. In some Los Angeles shops the ratio of women to men is three to one, and in some of the smaller plants the only male around is the owner himself, who is usually beyond draft age. One of the jobs for which plating shops have found women well suited is in applying gummed tape to parts which must be masked for partial deposition of metal. The Cadmium-Nickel Plating Co. of Los Angeles employs a number of girls for cutting tape and applying it.

Indicative of the acuteness of the manpower situation, the owner of one well-known plating shop in Hollywood, faced with the imminent induction into the army of his son and assistant, is contemplating closing up the plant for the duration and going to work for someone else.

Turco Products, Inc., is engaged in making building alterations in its factory, 6135 So. Central Ave., Los Angeles, at an estimated cost of $2,000.

William E. Curran, former manager of the company's Richmond, Calif., plant, has been appointed vice-president in charge of manufacturing and general manager of the eastern division of *Rheem Manufacturing Co.*, Los Angeles, and will make his headquarters in New York.

Chromite is reported being shipped out in considerable quantities from deposits in the Salmon Falls area of California, where operations are being handled by *United States Chrome Mines* and several other firms. Mining of commercial chrome is also underway in the Georgetown and Shingle Springs areas on properties acquired last year by *Trio-Chrome Mines Co.*

Manufacturers' Literature

New Buffing Composition Catalogue

Frederic B. Stevens, Inc., Dept. MF, of Detroit has just issued a new catalogue, which in addition to describing the various compositions they manufacture, contains numerous articles and charts pertaining to modern materials and methods used in polishing, buffing, deburring and cleaning operations.

The book is one of the most comprehensive of its kind ever published by any manufacturer, and will undoubtedly prove of value to metal finishers.

Special Service Report

Of vital concern today to safety engineers and supervisors, shop superintendents, and other plant executives is the control or prevention of bacteria growth in coolants used in various machining, cutting, grinding and other operations. To help combat contamination of these oil-water emulsions which, in some cases, is the source of dermatitis infection on the hands and bodies of machine operators, a new 4-page Special Service Report just issued by *Oakite Products, Inc.*, New York, describes many important, successfully used preventive measures.

The report stresses the need for thoroughly cleaning out main supply tanks, individual tanks or machines, lines, pumps, etc., to remove any bacteria-harboring films or accumulations. It outlines method and material for subsequent germicidal treatment which has proven unusually effective for this work.

Also given are eleven sanitation suggestions for plant cleanliness and individual hygiene, in connection with the handling of these oil-water coolant solutions, that will help prevent bacterial contamination and rancidity and extend solution life.

Free copies of this interesting report are available on request. Write to Oakite Products, Inc., Dept. MF, 18 Thames Street, New York 6, N. Y.

Copper Plating Booklet

An informative 6-page booklet describes the Unichrome Alkaline Copper Plating Process which has recently been installed for a wide variety of war-essential operations.

An outstanding advantage of the process is the non-toxic, non-gassing and non-corrosive solution employed. The bath contains no cyanide, does not attack clothing or equipment and gives off no objectionable or injurious fumes during operation.

The leaflet also contains a plating speed table, showing the time required to obtain various thicknesses as well as the wide range of current densities at which the process can be operated. Copy sent on request to *United Chromium, Inc.*, Dept. MF, 51 East 42nd Street, New York 17, N. Y.

Zinc Alloy Die Castings

Improvements in die casting equipment in recent years, combined with greater knowledge of the effect of die design on the properties of die castings, have had a startling influence on die castings of zinc alloy.

Continued investigations of the die casting art by the Technical Department of *The New Jersey Zinc Company* have made it necessary to issue an entirely revised edition of the bulletin, "Zamak Alloys for Zinc Alloy Die Castings."

This 64 page bulletin includes up-to-date technical data based on the results obtained from the new knowledge and experience. Copies may be obtained by writing The New Jersey Zinc Company, Dept. MF, 160 Front Street, New York 7, N. Y.

Stainless Steel Identification Chart

To help you identify various types of stainless steels which may have become mixed in stock, *The Carpenter Steel Company*, Dept. MF, Reading, Pa., has prepared a convenient chart which will be useful in separating stainless types that show marked differences in their chemical and physical properties.

Printed in four colors, the chart diagrams the stainless type numbers and describes eleven tests for separating the various types. These tests include nitric, muriatic and sulphuric acid tests, magnet, spark, hardness, nickel spot and stabilization tests, and the procedure for each is described simply and briefly.

It is assumed that the operator making the tests will have some technical knowledge of the various alloys in question. The tests are not designed to supplant chemical analysis, but they do provide a handy and quick method for segregation. If there is any doubt concerning any piece of stainless steel, use of the tests will help prevent troubles which might be caused by wrong treatment in fabrication or by improper use.

Convenient in size, the chart can be used right on the testing table.

Associations and Societies

American Electroplaters' Society 1944 Conference June 12, 13, 14

While it is too early to announce the completed plans of the Educational Committees, we are assured of the following highly informative papers to be presented:

"*Electro-forming*" *by Frank Savage*, Conn Instrument Company, Elkhart, Ind.

"*Research Report*", *Dr. William Blum*, Bureau of Standards, Washington, D. C.

"*Plastics and Plating on Plastics*", *Harold Narcus*, Chief Chemist, Plating Processes Company.

"*Hard Chrome Problems*", *Art Logozzo*. There will be a 45 minute clinic after this paper to answer questions and help with actual problems.

"*Indium*". One of the engineers of the licensors will discuss recent applications to alloy plating.

"*Alloy Plating*". *Chemist Diggin* from Hanson-Van Winkle-Munning and another authority from Westinghouse will collaborate on this subject.

"*Porous Chrome*". Presented by the Van Der Horst Company.

"*A Rapid Determination of Copper in Nickel Plating Solutions*" by *B. K. Knapp*, Research Laboratory, International Nickel Company.

"*The Relationship of Defects in Electroplate to the Gas Content of the Basis Metal*", *Charles L. Faust*, Battelle Memorial Institute.

"*Continuous Strip Plating*", *Dr. Swaldhiem*, duPont Company.

"*A Study of the Reactions in Nickel Deposition*", *Dr. Waite*, McGean Chemical Company.

The above list, plus such papers under consideration, point toward a highly informative and profitable Conference.

Plans for the Lady Guests

If your attendance at this Conference is to be influenced by how well your better half will be provided for during her stay in Cleveland, rest assured that her group will be well taken care of and their time fully occupied in the entertainment planned for them by the Cleveland Ladies' Committee. Give her an opportunity to relax and enjoy herself while you are preparing for "*Victory Thru Science*".

Newark Branch

The Newark Branch of the A. E. S. held election of officers at its regular meeting April 21. The following officers were elected:

President—Robert Sizelove
1st Vice Pres.—Louis Donroe
2nd Vice Pres.—John De Vries
Secy.-Treas.—George Wagner
Librarian—Edward Washburn
Board of Managers—Horace Smith, Paul Oldam and William Bruhns

Ladies' Auxiliary

The Ladies' Auxiliary of the Newark Branch of the A. E. S. has elected the following officers:

President—Mrs. Robert Sizelove
Social Secretary—Mrs. John Kotches
Secretary-Treasurer—Mrs. E. B. Washburn

The Auxiliary holds its meeting on the third Friday of the month.

Every third Wednesday of the month the ladies entertain the soldiers at the Weequahic Hospital in Newark. Homemade cakes, soft drinks, and games are supplied by the ladies. Mrs. E. Bauer plays the piano for the entertainment of the boys.

St. Louis Branch

St. Louis Branch *A.E.S.* on April 20th held its April meeting at the Engineers' Club Auditorium with a record attendance of 208. The business meeting was opened at 7:45 P. M. and routine matters were given prompt attention, including the yearly report of our Secretary-Treasurer, election of branch officers and delegates to the Cleveland Convention. The election results were as follows:

President—*Frank Menniges*
Vice-President—*Chas. Simon*
Secretary-Treasurer—*Chas. McGinley*
Board of Managers—*John Moran, Bruce Roberts, and Otto Dingeldein*
Delegates—*E. J. Musick, Chas. McGinley,* and *Alfred Barth.*
Alternates—*John Vogt, Otto Dingeldein,* and *Frank Cross*

Nine members were elected to membership thus bringing the total for this fiscal year to 36 new members.

As a token of respect to a brother member, *Hedley Richards*, who passed away on March 20th, all stood with bowed heads for a moment and *Mr. H. H. Williams* and *Mr. Burt Daw* were instructed to act as a committee to draw up appropriate resolutions expressing the deep feeling of the Society to Mrs. Richards.

The business session adjourned at 8:10 P. M. and the Engineers' Club took over and held a very brief business meeting in which they elected their slate of new officers and directors in a very smooth and dignified manner.

President L. O. Campbell of the *Engineers' Club*, after a warm welcome, introduced *President E. J. Musick* who outlined the work of the *A.E.S.*, particularly the St. Louis Branch activities, and he expressed much satisfaction over the attendance result of the joint meeting, which included 133 members of the Engineers' Club and 75 members and guests of the A.E.S. President Musick then introduced *Mr. Rudy Errington*, Librarian, who opened the Educational session at 8:25 P. M.

The first speaker, *Mr. L. G. Tubbs*, of the *Mutual Chemical Co.* of Baltimore, Md., presented a paper on the "Uses of Chromium Chemicals" in a thoroughly interesting manner. The second speaker was none other than *Mr. W. W. McCord*, past president of the *Detroit Branch* A.E.S. and until recently chief of the Electroplating Equipment Section of the W.P.B. at Washington, D.C., but now sales manager of the *Chandeysson Electric Co.* of St. Louis. Mr. McCord gave a "resumé" of the plating situation as it is today and its future as he sees it, in his usual cool matter-of-fact manner.

Questions and discussion followed and both speakers were given a rising vote of thanks for their services and the meeting adjourned at 10:45 P. M.

Los Angeles Branch

Joseph Sonderhaus, plating superintendent of F. G. Gilds & Son, Inc., band instrument manufacturing firm, was chosen president of Los Angeles Branch of the A.E.S. at the annual election meeting held April 10 at Hotel Rossiyn, Los Angeles. He succeeded *Emmette R. Holman*, chief chemist of Turco Products, Inc., who has headed the branch for the past two years.

Other new officers elected are:

1st vice-president, *E. W. Wells* of *Chas. F. Hommedieu & Sons Co.*, who was advanced from 2nd vice-president.

2nd vice-president, *D. N. Eldred* of the *DuPont Co.*

Secretary-treasurer, *Frank Bunker, L. H. Butcher Co.*

Librarian (re-elected), *Earl Coffman, Palace Plating Works.*

Board of Managers: *Ernest Lamoureux* (re-elected); *Emmette R. Holman*; and *Howard Woodward.*

Delegates: *Don Bedwell*, Bedwell Plating Co.; *Marcus Rynkofs*, Liberty Plating Co.; and *John Wiseman.*

Metal Finishing Society

The Second Annual Educational Session and Banquet was held by The Metal Finishing Society of Rockford, Illinois, Saturday, March 11, 1944, at Rockford, Ill.

The Educational Session was held at the Woodward Governor plant. The banquet, floor show and dancing was held at the Grand Ball Room of the Faust Hotel.

The following papers were presented and discussed:

"Thickness of Various Electro-Deposits, Method of Determining Thickness and Explanation of Specifications," by *R. B. Saltonstall, Ph.D., The Udylite Corporation*, Detroit, Michigan.

"A New Method of Furnishing High Purity Water to Plating Baths and Rinses," by *W. S. Morrison, Illinois Water Treatment Company*, Rockford, Illinois.

"The Cronak Process and Its Application to Zinc Surfaces," by *R. F. Burns, The New Jersey Zinc & Sales Company*, Chicago, Illinois.

Personals

Official U. S. Marine Corps Photo

The *American Buff Company*, 711 West Lake Street, Chicago, Illinois, recently received a photograph, shown above, from the *Public Relations Department of the United States Marine Corps*. The purpose of this photograph was for use in any house organ or trade journal depicting a marine telephone operator under combat conditions somewhere in the far Pacific Islands.

Imagine the surprise of *Mr. Ben P. Sax*, who is the head of the American Buff Company when, after opening the envelope he discovered that it was none other than his son, *Harold*. This is purely a coincidence. Mr. Sax had not heard from his son in quite some time and this was a most unusual way of contact between son and father.

Mr. and Mrs. Sax have two other sons in the service; one attached to the Navy and another in the Army. In addition to this, Mr. Sax is proud to have 33 other relatives, such as nephews and cousins, represented in all branches of the services.

A paper on specification gold plating was read before the *Providence, Attleboro Branch* of the *American Electroplaters' Society* at the Providence Biltmore Hotel on March 20, 1944, by *J. Frank Davis* of *A. Robinson & Son*, 131 Canal Street, New York City, makers of precious metals plating solutions.

While a very heavy snow storm cut down the attendance somewhat, the paper was received enthusiastically by those present.

A very limited number of copies are available to plating foremen.

Dr. Willis R. Whitney, honorary Vice-President of the *General Electric Company* and first director of its Research Laboratory, has been made an honorary member of the Electrochemical Society. A charter member of the organization and its president in 1912, Dr. Whitney was awarded the certificate of honorary membership from the Society's president, Dr. Robert M. Burns, on April 14, during the organization's meeting in Milwaukee.

One of Dr. Whitney's "most notable achievements in electrochemistry," a Society statement said, "was his proposal of the electrochemical theory of corrosion which is now universally accepted as the basis of corrosion reactions."

According to this concept, which has permitted metallurgists to develop metals that resist corrosion and have proved of great value in war equipment, miniature electric batteries are formed along the surface of a metal. These are short-circuited and the flow of current from one area to another is responsible for corrosion or "rusting."

Obituaries

Hugh Walter Spaulding

Hugh Walter Spaulding, Secretary of Handy & Harman, leading dealers and fabricators of precious metals, passed away on March 31, 1944.

Mr. Spaulding was well known throughout the silver exchange centers of the world, having served Handy & Harman as Silver Trader in both domestic and foreign operations for many years.

Starting with Handy & Harman in 1902, Mr. Spaulding rose in the company through the bookkeeping, accounting, and sales departments. He was appointed Cashier in 1919 and elected Secretary in 1924. He held this latter position until his death.

Amos G. Reeve

Amos G. Reeve, retired Plating Executive of the Oneida, Ltd., died March 31 at his home in Sherill, N. Y.

When a boy of approximately 15 years of age, Mr. Reeve went to work in the plating room of Oneida Ltd., at Niagara Falls, N. Y. By the time that he was 21, he was in charge of the plating room, and at 25 he was made Assistant Superintendent of the silverware plant at Niagara Falls; he continued in the capacity until he retired, on pension, in 1931.

During World War I, Mr. Reeve and the younger men working with him, helped Oneida Ltd. render an outstanding service in the lead plating of shells.

Mr. Reeve was the organizer of the first Buffalo Branch of the American Electroplaters' Society.

Albert D'Agostino

Albert D'Agostino, head of Alberts Plating Works, Brooklyn, N. Y., died Monday, February 28, after a long illness.

The business remains under the active management of his sons.

MAY, 1944

ORGANIC FINISHING

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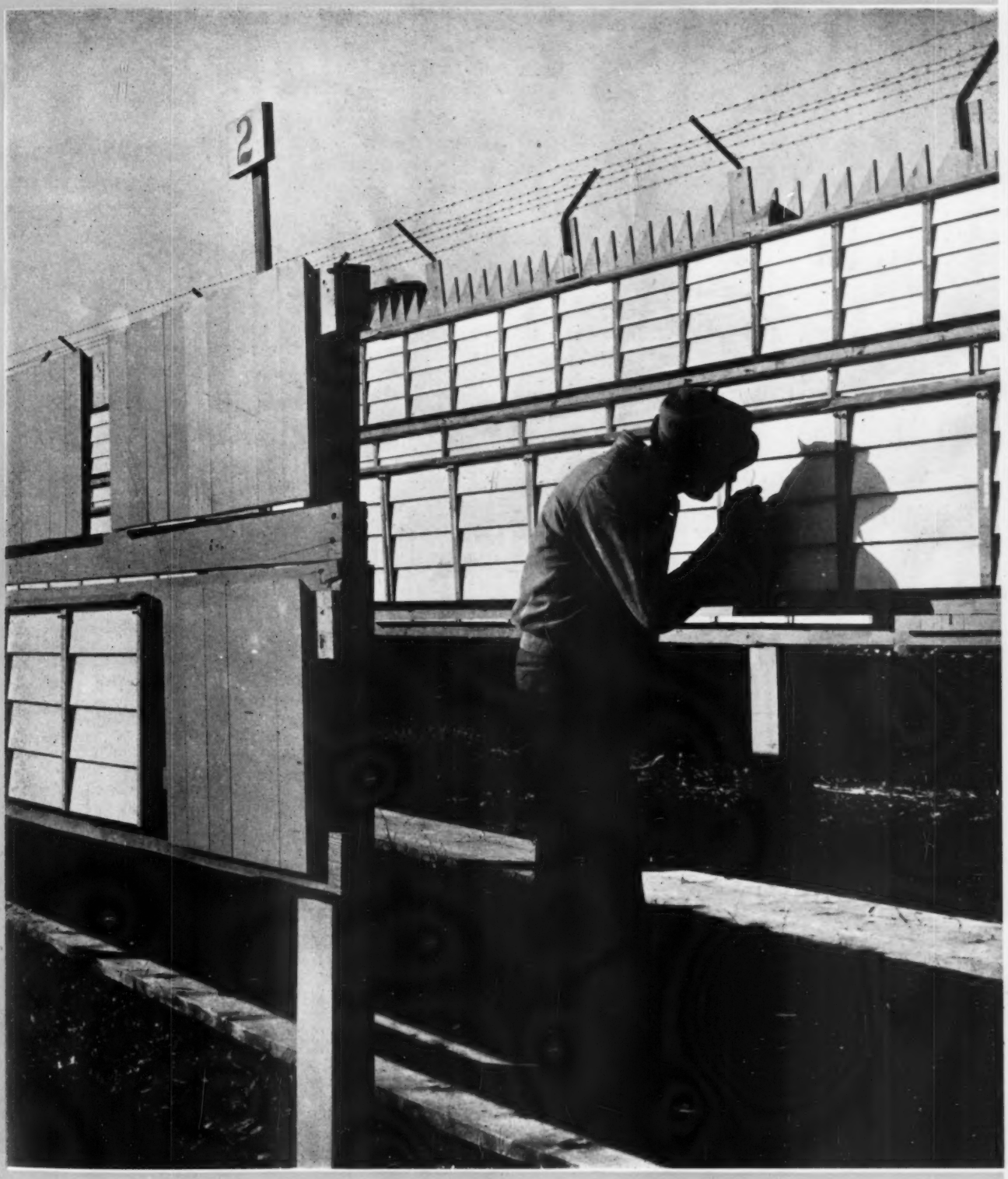

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ORGANIC FINISHING

SECTION OF METAL FINISHING

MAY, 1944

CONTENTS

Cover Photograph

Test fence for paints. *Courtesy New Jersey Zinc Co., New York, N. Y.*

Finishing Material Utilization

One of the major problems of our war effort has been, and to a more or less appreciable extent still is, the production of adequate amounts of suitable organic finishing materials. For a number of reasons, including insufficient supplies of both domestic and imported ingredients, there has not always been enough of the best types of finishing materials. To fill requirements, substitute ingredients and finishing materials have been developed and used. Much has been done by our manufacturers to make finishing materials of ingredients on hand which will meet requirements.

We wonder if as much thought and effort has been spent at the other end of the line—at the point of use. It occurs to us that much could be done to aid our finishing material situation if, in each finishing department, all finishing operations and methods were reviewed with the object of increasing material utilization. As a finishing material stands in its container, a given quantity will theoretically cover a given area or a number of pieces. Between this theoretical figure and actual coverage there can be and often is an appreciable difference. The spread can be due to direct loss, such as excessive overspray in spraying operations, poor drainage in dipping operations, etc. It can also be due to the application of films of greater thickness than are required which, incidentally, are often of less value than thinner films. In both cases valuable material is lost.

Now that the pressure is somewhat less than it was at the start of the war when production, sometimes even at the expense of efficiency, was all important, a survey of finishing material utilization is in order. Reduce material losses and the finishing material situation will automatically improve because of less demand on critical materials and manufacturing facilities. At the same time the finishing department will produce faster, cheaper and more efficiently.

L. H. LANGDON, *Publisher* • WILLOUGHBY G. SHEANE, *Associate Editor* • T. A. TRUMBOUR, *Business Manager*

NEWS FROM WASHINGTON—

By George W. Grupp
METAL FINISHING's Washington Correspondent

Alcohol Production In Mexico The 1943 production of alcohol from molasses and cane juice by the Sociedad Nacional de Productores de Alcohol of Mexico amounted to 38,000,000 liters. Another 8,000,000 liters were produced from other sources. This total of 46,000,000 liters of 1943 compares with 36,100,000 liters in 1942 and with 23,300,000 liters in 1940.

"When You Hire Women" The United States Department of Labor has released for free distribution a pamphlet entitled "When You Hire Women". This pamphlet treats on such subjects as (1) How to decide where women will fit in your plant, (2) How to make a job fit the woman worker, (3) How to make women workers satisfied with your factory housekeeping, (4) How to keep tears under control and gripes at a minimum, (5) How to teach a woman a new job, and (6) How to keep a woman on the job.

Container Relief Not In Sight It is the opinion of Edward J. Detgen, Director of the Containers Division of the WPB, that during the forthcoming six months the packers and shippers who use tin cans, steel drums, pails and metal enclosures cannot expect an improvement in the availability of the supplies of such goods.

Capital Additions Labor Costs The rules governing minor capital additions under the Controlled Materials Plan Regulation No. 5 were clarified in Interpretation No. 11 issued on March 23, 1944. This interpretation points out specifically what labor costs may be excluded in determining the value of the addition. On this the interpretation says: "The labor costs which may be disregarded in this connection are the services of the purchaser's own regular employees, additional employees hired for installing new equipment or doing construction, and fees paid to independent contractors who install equipment or do construction where, under normal business practices, the fee is paid primarily for services as distinct from materials."

Carbon Black Discussed At the April 12, 1944 meeting of the WPB's Carbon Black Manufacturers Industry Advisory Committee it was brought out that at the April rate, the 1944 production of carbon black may reach 372,600,000 pounds. Expected production from approved projects now under construction will total 42,000,000 pounds and projects recommended for approval will furnish an additional 65,000,000 pounds. Therefore the annual production may reach 479,000,000 pounds by December 1944.

Dipentine Under Allocation Control Dipentine, a product used in marine paints, has been placed under allocation control by amending General Allocation Order M-300 on April 19, 1944. This action was taken because the demand for this product exceeds the supply.

Can Enamels Preference Rating Raised In issuing Preference Rating Order P-149 on April 15, 1944, can enamel manufacturers were assigned an automatic preference rating of AA-2 to make it easier for them to procure raw materials for production of certain can enamels. The priority rating for can enamels was AA-3.

Hi-Flash Naphtha Allocations Eased Officials of the Chemical Bureau of WPB revealed on April 5, 1944 that future allocations of hi-flash naphtha, used chiefly in the manufacture of protective coatings, will now be made on a broader end-use pattern because of increased production. Hi-flash naphtha is controlled under Order M-350.

Linseed Oil Restrictions Eased Restrictions on the amounts of linseed oil that may be included in various types of protective coatings were relaxed on April 12, 1944 by an amendment to Order M-332. The easing of the linseed oil situation has made it possible to allocate larger quantities. All changes in the number of pounds of linseed oil that may be used per gallon in paste and ready-mixed paints are set forth in paragraph (b) (1) of the amended order.

Revision of Order M-81 Urged At a recent meeting of the Paint, Varnish and Lacquer Industry Advisory Committee the members recommended that Order M-81, governing cans, should be amended to permit the industry to accept delivery and use of 40 per cent of its normal quota during the second quarter of 1944. The order at present limits the paint industry to 25 per cent of its base period quota in the second quarter of 1944. The base period quota assigned for paints is 75 per cent of 1940 usage.

Increased MRO Quota Procedure Controlled Materials Plan No. 5, Direction No. 18 was issued on March 17, 1944 to establish rules of procedure on how to apply for an increase of maintenance, repair and operating supply (MRO) quotas. To obtain an increase the application merely has to write a letter giving such information such as (1) the name of products manufactured or description of services rendered; (2) quarterly quota authorized under paragraph (f) in 1943; (3) statement of the dollar value of products delivered in 1943 and the first and subsequent quarters of 1943; (4) statement of total amount of MRO requested; and (5) total amount expended during 1943 for minor capital additions.

Paint Container Quotas Will Not Be Changed The Chemicals Bureau of the WPB is warning Paint manufacturers that it is unlikely that any quota adjustment will be made this year in container quotas under Order M-81.

Priorities Regulation No. 7A Amended Priorities Regulation No. 7A as amended March 21, 1944 makes it clear that except in connection with the transfer of a business as a going concern or with the express permission of the WPB, production quotas may not be transferred from one person to another under any circumstances. The amended regulation also points out that one person who has several establishments may distribute his quota among them as he sees fit unless his quota was acquired as the result of a transfer of the business of a going concern. No person may transfer to another a preference rating, or right granted, by a specific authorization of the WPB, except where such a move is part of the transfer of a going business. Such transfers should be distinguished from the use of preference ratings for the purpose of obtaining materials or products.

Pyronate Under Allocation Control "Pyronate" a new pyroligenous alcohol denaturant was placed under allocation control by Miscellaneous Chemicals Order M-340 as amended April 12, 1944. The small order exemption has been fixed at 54 gallons a month.

Zein Allocation Order Revoked Zein Allocation Order M-320 was revoked on April 19, 1944 because of the increased production and supply of shellac. WPB officials report that during February and March 100 per cent allocations were made.

WHEN YOU CHECK UP ON YOUR PLANT'S PAY-ROLL SAVINGS PLAN FIGURES!

These days, things change with astonishing speed. The Pay-Roll Savings Plan set-up that appeared to be an outstanding job a short time ago, may be less than satisfactory today.

How about checking up on the situation in *your* plant? Checking up to see if everybody is playing his, or her, part to the full measure of his, or her, ability. Checking up to see if 'multiple-salary-families' are setting correspondingly multiple-savings records.

A number of other groups may need attention. For example, workers who have come in since your plant's last concerted bond effort. Or, those who have been advanced in position and pay, but who may not have advanced their bond buying accordingly. Or even those few who have never taken part in the plan at all. A little planned selling may step contributions up materially.

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Durability Characteristics of Lustreless Enamels

By S. E. BECK

Part I.

Finishing materials of high and low gloss differ considerably in many respects, as many have experienced in changing from glossy peace time finishing materials to the more or less low gloss finishing materials required by specification on many war items. This article discusses the durability of lustreless enamels, the various factors involved, etc., and contains much information which will provide a background and appreciation for these materials. —Ed.

The widespread adoption of lustreless coatings by military and industrial users has caused much interest in the durability characteristics of these materials. Lustreless enamels are employed chiefly for outdoor service, over a variety of substrates, and often in the most deleterious environments. Finishes on military equipment may be subjected to salt air as during overseas shipment, tropical or arctic temperatures, and severe shock or abrasion in service. Industrial applications, such as factory or storage tank obscuration frequently involve exposure to bad atmospheric contamination. Sulfur dioxide, for example, is a common industrial air contaminant. It causes rapid fading of ultramarine blue and is considered by some to be one of the most destructive agents for paint films commonly encountered, exceeding in importance temperature or humidity (4). Under these conditions, it is not surprising that durability problems have appeared.

There are four main durability criteria for lustreless enamels:

1. Color permanence (visual or infra-red).
2. Chalking resistance.
3. Wear resistance (to the forces encountered in service).
4. Substrate protection (against weathering or special agents).

This paper will not discuss wear resistance or substrate protection except in passing. Substrate protection is a large topic and would require separate treatment. About wear resistance, there is less information. Color permanence and chalking resistance will receive the chief attention of this paper.

The relative importance of each factor depends upon the use to which the lustreless enamel is put. In order to consider this subject, the following classification of commonly encountered substrates is presented:

A. Metal.
   1. Ferrous.
      a. Light gauge.
      b. Heavy gauge.
   2. Non-ferrous, non-corroding (lead, brass).
   3. Non-ferrous, corroding (aluminum, magnesium.)

B. Non-Metal.
   1. Wood.
   2. Vegetation.
   3. Fabric.
   4. Concrete.
   5. Miscellaneous (asphalt, glass, rock, etc.)

Color permanence and chalking resistance are of paramount importance on all of the substrates listed, with the possible exception of vegetation. One can hardly expect a high degree of permanence when an organic coating is applied over grass.

Wear resistance is a difficult subject to discuss in general terms. Some heavy gauge equipment, such as tanks and armored troop carrying cars, receive tremendous impact and abrasion wear in service, necessitating repainting very frequently. Concrete or asphalt paints are also subjected to severe abrasive action from wheeled vehicles. There is little organized knowledge on the subject of wear resistance and as a general rule the other feature required, such as gloss, sheen, drying speed, and other performance requirements, leave little room for formula modifications to improve wear resistance.

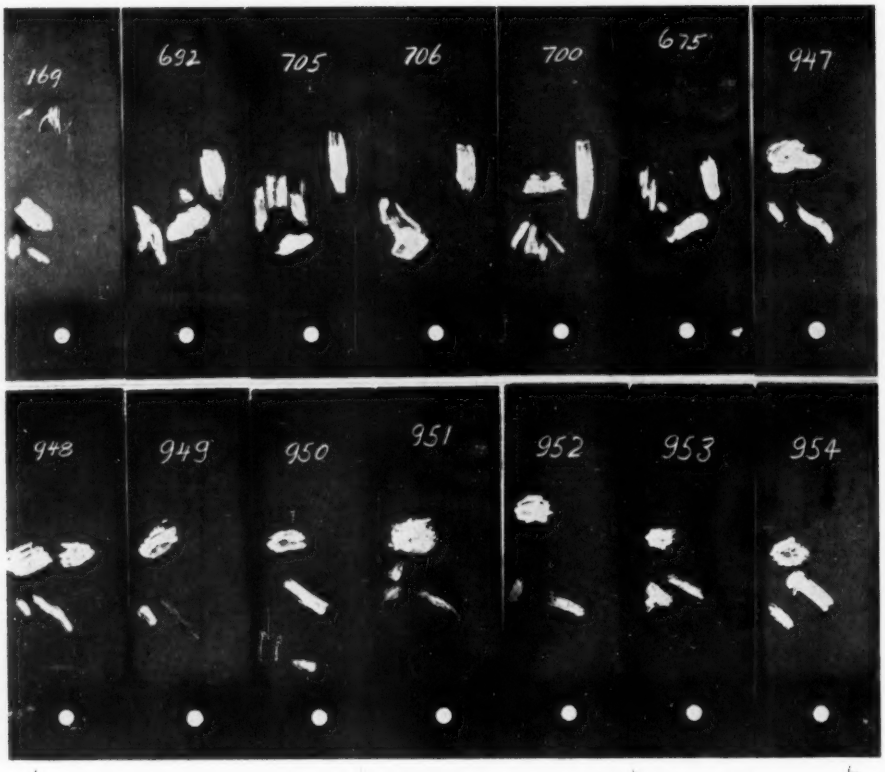
Substrate protection is important when the coating is applied over light gauge ferrous metal, non-ferrous corroding metal, wood and fabric. It is of little importance when heavy gauge ferrous metal, non-ferrous non-corroding metal, asphalt, glass, rock, etc., are used as substrates. In the case of concrete, the situation is reversed. The coating must be protected from the substrate. In general, little substrate protection is obtained from the lustreless enamel. This property must be achieved by means of undercoats, sometimes as many as five coats being required. In a few special cases, such as alkali or acid resistance, appreciable protection can be obtained from the lustreless enamel by employment of specialized vehicles.

Color Permanence and Chalking Resistance

The principal emphasis of this paper will be laid upon appearance retention since this property is by far the most significant under the conditions of military usage.

As a first approximation, color permanence and chalking resistance may be considered to be substantially independent of the substrate. This will be the case where adequate undercoats have been employed so that the factors of adhesion and substrate protection do not require consideration.

It is advisable to consider color permanence and chalking resistance together because of the difficulty in appraising each factor separately. In the case of dark colors, surface chalking generally causes a lightening or apparent fading which is actually as objectionable as true or chemical color change. In the lighter colors, especially yellows and tans, chalking



Appearance differences shown by lustreless enamels after two years' exposure. (Disregard bright splashes of aluminum paint covering knife marks.)

Paints Nos. 169, 705, 706 are three different chlorinated rubber modified alkyd base materials. Nos. 692,700 are 100% phenolic varnish base. Nos. 675, 947, 954 are paints. Nos. 1-9 in Table II.

is less objectionable because of the diminished contrast between the original color and the surface chalk.

The following components include those factors having greatest influence on color permanence and appearance retention.

Investigations have been conducted (for lustreless enamels) on most of them.

1. Prime pigment.
2. Prime pigment — extender ratio.
3. Extenders.
4. Pigment volume.
5. Pigment oil absorption.
6. Binder.

Prime Pigment

Parker (7) has studied the influence of the nature of the prime pigment upon the appearance retention of lustreless enamels of the oil base type (T-1215A). With the exception of greens, the ordinary low cost durable pigments such as carbon black, lithopone, iron oxide red, yellow and black, etc., perform quite satisfactorily. Black paints made up with only 1.75% of carbon black and 98.25% of magnesium silicate showed good color permanence. Difficulty was experienced, however, in formulating greens. Use of iron blue and yellow iron oxide (with some light chrome yellow as a tinting color) gave materials not equal in color permanence to the other colors tested. Use of phthalocyanine blue in place of iron blue gave a moderate improvement in durability. A further improvement was obtained by using chromium oxide. These improvements are at greatly increased cost, making the product non-competitive under present conditions. Thus, for most colors, ordinary durable pigments are satisfactory. Greens are a difficult and as yet unsolved problem. This does not apply to olive drab.

Bright red is a difficult color since toluidine toner shows poor color permanence in lustreless enamels. In many cases a bright red oxide color can be substituted for a toluidine red color with satisfactory consumer acceptance especially if the fugitive nature of toluidine formulations is pointed out. Ultramarine blue is another poor pigment, while iron blue and monastral blue are both very good, provided the darkening tendency of iron blue is not objectionable.

The author has done some exposure work on the color permanence of prime pigments in alkyd base lustreless olive drab enamels. The enamels were made up according to the standard formula in Table I. and exposed on steel panels, over a standard primer, for a period of two years in Baltimore, Md., using southern exposure at 45°. Driers used were Co 0.30%, Mn 0.01% and Pb 0.20% on resin solids basis. All paints were ground in a ball mill.

TABLE 1. Formula for Lustreless Olive Drab Enamel. Prime Pigment Study.

Pigmentation	% by volume of total pigment
Prime pigment	20.4
Magnesium Silicate	35.4
Diatomaceous Silica	34.6
Barytes	9.6
	100.0

Formulation	% by wt. of total paint	% by vol. of total solids
Solids	60	
Alkyd Resin (35% phthalic Anhydride)		53.3
Total pigment		46.7
		100.0
Volatile (mineral spirits)	40	
	100	

The various prime pigments studied and the exposure results are given in Table II.

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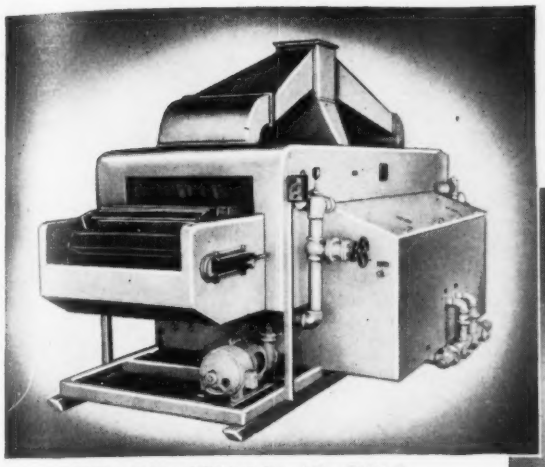

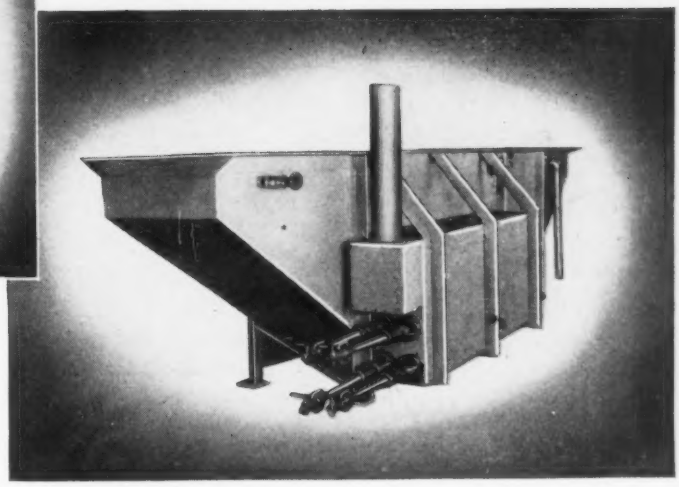

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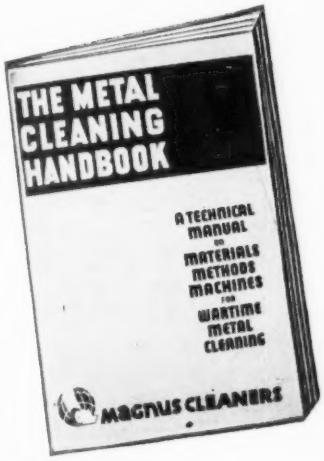

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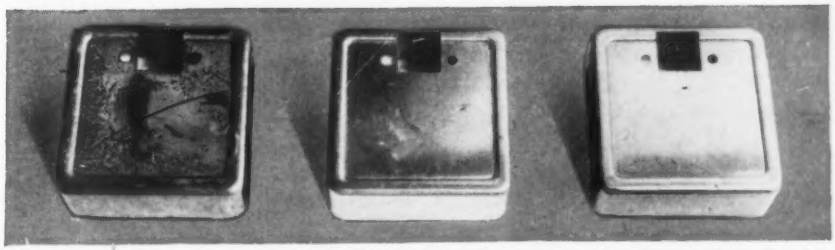

Instrument case stamped with lubricant containing lithopone. Left: Case before cleaning. Center: Case after Emulso-Clean dip and rinse. Ready for any finishing operation except plating. (Note water break which indicates need for chemically clean surface if plating is to follow.) Right: Case electro-cleaned with Magnus 94XX for plating.

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TABLE II. Effect of Prime Pigment on Appearance Retention.

No.	Prime Pigment Combination	% by wt.	Exposure Observation
1.	Yellow Iron Oxide	67.0	Slight fading and chalking.
	Lamp Black	7.1	
	Chrome Yellow Medium	25.9	
		100.0	
2.	Yellow Iron Oxide	65.5	Moderate fading and chalking.
	Magnetic Black Oxide	34.5	Slight yellowing.
		100.0	
3.	Yellow Iron Oxide	92.5	Marked fading and chalking.
	Lamp Black	7.5	Slight yellowing.
		100.0	
4.	Yellow Iron Oxide	60.0	Extensive fading and chalking.
	Bone Black	40.0	Moderate yellowing.
		100.0	
5.	Phthalocyanine Blue	16.0	Extensive fading and chalking.
	Yellow Iron Oxide	42.0	Marked yellowing.
	Red Iron Oxide	42.0	
		100.0	
6.	Chrome Yellow Medium	62.5	Marked fading and loss of chroma.
	Magnetic Black Oxide	37.5	No yellowing.
		100.0	
7.	Yellow Iron Oxide	67.50	Marked fading and chalking.
	Chrome Green	14.25	Decided green color.
	Magnetic Black Oxide	11.50	
	Red Iron Oxide	6.75	
		100.00	
8.	Chrome Yellow Medium	89.0	Moderate chalking, extensive darkening.
	Lamp Black	11.0	Color dark gray.
		100.0	
9.	Chrome Green Deep	100.0	Extensive fading and chalking. Color bright blue.

Ignoring formula #1 for the moment, it can be seen that yellow iron oxide is superior to chrome yellow for lustreless olive drab enamels in that chrome yellow tends to darken and produce a gray color. Comparison of lamp black, bone black and magnetic black oxide indicates that magnetic black oxide is most suitable with either chrome yellow or yellow iron oxide. Chrome green is quite unsatisfactory, confirming the work of Parker mentioned above.

Formula #1 using yellow iron oxide, lamp black and chrome yellow gave by far the best performance. This superior performance of the mixture of yellows may be due to neutralization of faults, i.e., the graying tendency of the chrome yellow may be offset by the yellowing tendency of the yellow iron oxide. The satisfactory performance of formula #1 plainly shows that it is not unreasonable to expect a minimum performance of two years' outdoor exposure from the point of view of appearance permanence. Actually, certain materials have lasted three years at the time of writing and show no signs of imminent failure. These comments apply to alkyd resin base materials.

Prime Pigment-Extender Ratio

In lustreless enamels, the importance of the vehicle is greatly enhanced. There is so little vehicle present, in comparison with gloss enamels, that the rate of vehicle failure becomes a much more important factor. As the vehicle film is destroyed, dry pigment is released in the form of chalk and, in addition to the attendant color change, erosion begins.

One of the chief natural destructive agents of paint films is ultraviolet light. Use of pigments low in ultraviolet transmission will provide a shielding effect on the vehicle, thereby increasing the appearance permanence of the lustreless finish. Extenders are generally high in ultraviolet transmission, affording little protection. Magnesium silicate, for example, in a film 0.00092 mm. thick transmits 90% of incident light at 3655 A° and 89% at 3131 A°. Prime pigments in general are relatively opaque to ultraviolet light as shown in Table III (6).

(*Continued on page* 316)

TABLE III. Ultraviolet Transmission of Pigments.

Pigment	Percent Transmission at 3655A°	3131A°
Zinc Oxide	0	0
Carbon Black	0	0
Chrome Yellow	0	0
Red Iron Oxide	0.5	0
Barium Sulfate	65.0	64.0
Calcium Carbonate	68.0	66.0

Electrophoretic Finishing

By EDWARD J. ROEHL
Little Silver, N. J.

THERE exists a section of the field of electrodeposition with which the electroplater and finisher are perhaps not entirely aware. The electrophoretic plating of rubber has been for some years a commercially successful operation and a considerable number of other materials have been similarly treated.

A potential difference is always found at the interface between two phases and when one phase is a suspension of finely divided particles (solid, liquid or gas) in a liquid, the relative movement of particles and liquid is known as electrophoresis. The potential difference arises from electrically charged layers of opposite sign at the interface between particle and liquid and the motion is produced by the application of an electrical field. The diffuse double layer at the interface is analogous to the Debye-Hückel concept of the oppositely charged ion-atmosphere surrounding an ion. The velocity with which the particles move is a function of the dielectric constant and viscosity of the suspending liquid, the applied field strength and the electrokinetic potential at the interface. This electrokinetic potential or zeta potential should not be confused with the Nernst potential present at the electrodes in a metal plating bath.

Attempts to relate electrophoretic mobility and particle shape have been rather inconclusive. The equation for the mobility does not contain any term for the particle size and in general the values for the mobilities are about 2 to 4×10^{-4} cm. per sec. in water for a gradient of one volt. Since these values are of the same order of magnitude as those for the larger electrolytic ions, the rather surprising result is obtained that there is hardly any difference between the mobility of a microscopically visible glass particle, for example, and that of an ion. On the other hand, compared to a solution of appreciable concentration of an electrolyte, the conductivity of the colloidal solution employed in electrophoresis is quite low because the number of current-carrying particles is very small. As a result, high bath voltages are to be expected in electrophoresis.

Substances such as carbon, metals, sulfur and cellulose, upon being finely ground and suspended in water, are found to possess a negative charge due to the adsorption of hydroxyl ions, whereas metallic oxides and hydroxides are usually positively charged through adsorption of hydrogen ions. Negatively charged particles, when an e.m.f. is applied, migrate to the anode, positively charged to the cathode, and in each case the suspending liquid moves in a direction opposite to that of the particles. The sign of the charge can usually be reversed by the addition of various salts to the solution, or by changing the solvent, thus reversing the migration direction. For this reason the pH of the solution is of definite interest.

The concept of throwing power is of considerable interest and importance in electrophoretic plating. For example, in wax coating the interiors of conical-topped beverage cans, it has been found possible, by the choice of suitable wax composition and dispersion medium, to obtain a uniform coating with a cathode in the form of a narrow rod of uniform cross-section. Previously it had been necessary to use concentric cathodes. In some respects the mechanism of the formation of uniform deposit thicknesses may be similar to that found in the production of black molybdenum deposits. As the deposit builds up the resistance increases and the current is shifted to more remote sections of the cathode. The uniformity will depend upon how rapidly nearly complete insulation results from the deposit. In wax coating cans, if the current density is too low, the current remains substantially constant and the deposit shows marked non-uniformity if the interelectrode distance varies. However, on increasing the current density, a progressively more pronounced drop in current occurs during deposition and the coating becomes substantially uniform.

As in metal plating, the thickness of the deposit is, within limits, a direct function of the current density and the time of deposition.

Adhesion of deposit to base metal is of primary importance. A grease-free surface is obtained by the customary methods, and is supplemented by various techniques, for example, by an annealing operation.

Rubber

The electrophoretic deposition of rubber is particularly adapted to the coating of articles of intricate shape, as the solution shows a high throwing power. It is used for coating a wide variety of objects such as wire screens, sieves, fan blades for the circulation of corrosive gases, racks for use in electroplating, metallic baskets, etc.

The latex mix, which may contain 35% by weight of rubber, also contains accelerators, sulfur, zinc oxide and other materials, all of which migrate to the anode, are homogeneously incorporated in the deposit and serve their usual functions. The anode compartment contains the ammonia-latex mix and the article to be coated and is separated from the cathode compartment by porous diaphragms. The catholyte is slightly alkaline water. The pH must be correct. If it is too low, the deposits are soft and may crack on drying. If too high, they have too high an electrical resistance and may overheat. Zinc is preferred as the anode material but other materials can be used. When an e.m.f. is applied, zinc ions pass into solution and neutralize the rubber particles, which precipitate on the anode. Deposits contain about 40% of water, sufficient to maintain the conductivity of the deposit and to permit deposition to continue. Current densities of 7 to 20 amps. per sq. ft. are common, at 10 to 100 volts, to produce deposits $\frac{1}{32}$ to $\frac{1}{8}$ inch thick. Higher current densities produce smoother deposits and show better throwing power but they cannot be used for appreciable lengths of time because of excessive heating due to high resistance in the fresh rubber deposits. Deposition may be carried out at as high a rate as four grams of dry deposit per ampere minute, a rate more than five hundred

times as fast as that normally employed for zinc. After drying, the deposits are vulcanized in the usual manner to any desired cure.[1, 2]

Waxes

Beeswax, ceresin, paraffin, etc. are used for coating metals, particularly the inner surfaces of metal containers for foods and beverages. Molten waxes or mixtures have been used, but not satisfactorily, due principally to the tendency of the wax to drain away from the certain portions of the metal surface such as seams or corrugations. As an example, 40 gms. of beeswax are dispersed in 2 liters of a 1% solution silicate solution. The silicate has the effect of increasing the throwing power of the solution. A current density of 30 to 40 amps. per sq. ft. is employed for a period of about 6 seconds, the particles traveling toward the anode. The deposit is then dried and heated to a continuous coating.[3]

Natural and Synthetic Resins

Oleoresinous lacquers are used for coating the inner surfaces of food cans, the desired thin deposits—5 mg. per sq. inch—being produced in a few seconds.[4] Synthetic resins are employed for the same purpose.[5] The cans are carefully cleaned and degreased, connected as anode and the deposit applied from an emulsion of the resin and oil. A drier is also present and is likewise deposited.

Phenol-formaldehyde, urea-formaldehyde and various synthetic resins are also used for coating metal objects for the electrical field. Fabrics and paper are coated by placing them in contact with the anode. Electroforming can be carried out by depositing on the inside of a cup or tube and allowing the material to harden before removal. Vulcanizing agents, softeners, adulterants such as carbon black, binding agents such as shellac, dyes and rubber may be codeposited with the resin. Current densities of 5 to 10 amps. per sq. ft. are used and films up to 0.1 inch thick, dense, non-porous and resistant to corrosion, can be obtained.[6]

Shellac, for insulating coatings and in combinations such as indicated above, have been deposited.[7] The particles are negatively charged and are suspended in a 1% solution of sodium carbonate. Japans can also be deposited.[8]

Graphite

Electrodeposited graphite has been applied to the electrodes of discharge tubes, such as radio receiving and transmitting tubes, rectifying tubes, etc., for corrosion resistance and in other cases to reduce friction.[9] A solution containing approximately 0.02% by weight has been used, the graphite being either negatively or positively charged depending on whether an alkali or an acid is added to the solution. At about 2 amps. per sq. ft. a 0.00004 inch deposit is obtained in 7 minutes.

Finely divided graphite, stabilized with gelatin, has been successfully codeposited with copper from an acid solution at a current density of about 20 amps. per sq. ft. The purpose of the work was to produce a self-lubricating bearing metal and as much as 16% of graphite was incorporated in

the deposit. It was felt that the electrolytic product would be superior to that made by compression in regard to strength and homogeneity, and it could be plated directly on the journal.[10] It has been indicated that the material showed a good performance during bearing tests.

An investigation was started to discover a method for codepositing tin and graphite, but the work was interrupted by the war.[11]

Carbonates, Oxides and Metals

Carbonates have been suggested principally for covering the incadescent cathodes of electrical discharge tubes. Barium, magnesium, barium-strontium, etc. are employed. They are deposited on the metal core from suspensions in various organic liquids and are then decomposed to the corresponding oxides by heating. Nitrocellulose may be codeposited to act as a binder to give adherent properties to the deposit.[12]

Various oxides may be used for the same purpose. As an example,[13] 150 c.c. methanol, 225 gms. finely divided alundum, 3 gms. magnesium nitrate and 7½ gms. aluminum nitrate are dispersed by mixing. The object is made the anode, with an aluminum cathode and, at 45 volts, 2 to 2½ mils of deposit are obtained in 4 to 5 seconds. The nitrates also deposit and serve as binding agents. After rinsing, the coated object is hydrogen annealed at 1550°C. for several minutes, converting the nitrates to oxides and producing a very hard, dense, strongly-adherent film.

Aluminum oxide is also deposited on tin plate which is to be used to make containers for foodstuffs,[14] as the non-toxic character of the oxide makes it a suitable compound either for direct contact with the foodstuff, in cases where a lacquer is unnecessary, or as a basis for the application of a lacquer where this is desirable, the oxide acting to increase the adhesion of the lacquer. For certain uses the oxide, after deposition, can be dyed for producing decorative coatings.

Calcium fluoride and sulfide have also been deposited.[15] From a finely divided suspension of zirconium in acetone, a cathode can be coated with the metal in one minute at 200 volts for an electrode spacing of one cm.[16]

Cellulose

Cellulose has been deposited for insulating and other uses.[17] It is dissolved in a solution of zinc chloride or hydrated cupric oxide in concentrated ammonia and is deposited at the anode, using 110 volts and a current density of 75 amps. per sq. ft. The electrophoretic plating of Celanese, mercerized cellulose, mercerized cotton, hydrocellulose, oxycellulose, acetyl-cellulose and artificial silk has also been investigated.[18]

Bitumin

The negatively charged material is deposited on metallic objects for various purposes. About 25% by weight of petroleum bitumin is dispersed with an asphalt oil, paraffin wax and a protective colloid such as casein. A voltage of 110 volts is used at a current density of 25 amps. per sq. ft.[19]

Glass and Enamel

Glass and enamel can be electrophoretically plated and the advantage is claimed that the thickness can be readily and accurately controlled. Good adhesion is obtained and by proper heating it is possible to avoid the formation of gas bubbles in the finished product. The glass is crushed and ground and then suspended in an organic liquid such as acetone, where it is negatively charged, or methyl alcohol, where it is positively charged. Wires, discs, plates and tubes can be coated for insulating purposes. It is fairly flexible in thin layers and variations are possible, such as the addition of PbO to give a black enamel.[20] Electrophoresis with aqueous solutions has also been investigated.[21]

Lubricants

Electrophoretically plated lubricants have been used in wire drawing and it was found that a pronounced reduction in pull was affected. A 0.225% solution of a sodium soap was used at 30 volts, 0.5 to 23 amps. per sq. ft., for a period of 0.1 second. The assumption is that the deposited film is a copper soap, formed by the action of the fatty acid radical ions and the copper ions from the wire.[22]

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DURABILITY CHARACTERISTICS OF LUSTRELESS ENAMELS

(*Continued from page* 310)

Of course not all prime pigments are highly opaque. Iron blue, organic toners, ultramarine blue, chromium oxide and certain others are comparatively transparent. But, in general, it is a safe working assumption to consider prime pigments as high in opacity and extenders as low.

It follows from this that, in general, the higher the percentage of prime or color pigment and the lower the percentage of extender the greater will be the ultraviolet shielding effect of the pigment on the binder and consequently improved appearance retention will generally result. Parker (7) states in this connection, "Exposure tests indicated that one of the most important factors influencing the color retention of these paints (T-1215) is the ratio of prime pigment to extender . . . the higher the ratio of prime pigment to extender . . . the better the color retention of the product will be."

Data from a related field is of interest in this connection and may be applicable. Beck and Goldberg (3) working on gasoline-removable lustreless enamels showed that the removability of these materials after exposure is influenced by the prime pigment-extender ratio. The removability (with gasoline) after exposure is related to the degree to which the binder has been affected by ultraviolet light. The further polymerization and progressive hardening proceed, the lower the gasoline removability of the finish becomes. This study showed that pigments give ultraviolet shielding to the vehicle in reverse order to the ultraviolet transmission of the pigment and that lowering the prime pigment-extender ratio lowered this protection. In the case of TiO_2—magnesium silicate pigmentation, the critical point is reached at about 40% TiO_2 by volume. Where the magnesium silicate exceeds 60% of the pigment by volume, this protective action falls off rapidly.

These figures are not directly adaptable to ordinary lustreless enamels, of course, because the study was made using special vehicles which were non-oxygen-convertible and of relatively low ultraviolet absorption. The important fact that prime pigments of high ultraviolet capacity shield the binder from ultraviolet rays is adaptable to lustreless finishes in general, however, and supports the contention that the prime pigment-extender ratio should be maintained at the highest level commensurate with adequate specular properties and competitive prices.

(*To be concluded*)

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TRICHLORETHYLENE

Problem

What are the hazards of trichlorethylene and what precautions should be taken in its use?

Hazards

The principal hazard is that of poisoning by inhalation of the vapors. Poisoning may also occur through skin absorption of the liquid or vapors. Prolonged contact of the skin with the liquid or vapors may result in dermatosis because of the removal of the natural skin oils.

Discussion

Trichlorethylene is a heavy, colorless liquid with an odor similar to that of chloroform. It volatizes into a colorless, non-flammable and non-explosive vapor about 4.5 times heavier than air. However, the vapor does ignite at about 410° C. (770° F.). Pure trichlorethylene boils at 86.7° C. (188° F.). Some commercial grades boil at a slightly lower or higher temperature.

Trichlorethylene does not normally decompose in the presence of water and the common industrial metals, even when heated for long periods at temperatures up to and somewhat above its boiling point. If air containing trichlorethylene vapors is drawn into or comes into contact with open flames, arc, or gas welding, the vapors will decompose with the formation of toxic and corrosive substances such as hydrochloric acid and phosgene. Similar decomposition will also occur if air containing trichlorethylene vapor is inhaled through burning tobacco in lighted cigarettes, cigars or pipes. Pure trichlorethylene is very stable but the resistance to decomposition of the commercial grades will depend to a great extent on the impurities present.

Trichlorethylene is used principally as a solvent for oils, greases and waxes. In industry, it is used for the extraction of edible and inedible oils and fats, isolating and purifying certain drugs, dry cleaning of raw and finished fabrics, the degreasing of metals, leathers, wools, bones and miscellaneous materials, for fumigation, as an insecticide and as a raw material for the preparation of other chemicals. It is also used as a refrigerant for certain substances and as a base solvent in the preparation of commercial pastes, polishes, cleaning compounds, and soaps.

Trichlorethylene vapors, like those of other chlorinated hydrocarbons, are toxic. Some authorities state they are among the least toxic of all such vapors. However, a mixture of 10,000 parts of trichlorethylene to 1,000,000 parts of air is considered definitely narcotic to persons. One state has set the maximum allowable concentration at 200 parts of trichlorethylene per million parts of air. It is believed that any noticeable concentration of trichlorethylene vapors constitutes a potential health hazard and that human beings should not be exposed to atmospheres in which the odor of trichlorethylene is detectable. The data available indicate that the action of trichlorethylene is not cumulative in effect and that under normal conditions with reasonable precautions trichlorethylene may be used with safety.

Symptoms

Trichlorethylene has anesthetic effects similar to those caused by chloroform and carbon tetrachloride but there is some evidence that, unlike those substances, trichlorethylene does not cause fatty degeneration of the liver. Temporary exposure to trichlorethylene vapors of both high and low concentrations has resulted in irritation of the upper respiratory tract, nausea, vomiting, diarrhea, headache and general ill feeling. Those effects were usually of short duration. Cases have been reported in which trichlorethylene poisoning has resulted in the temporary loss of feeling in parts of the face and mouth supplied by the trigeminal nerve and of a temporary loss of vision because of the effects of the trichlorethylene on the optic nerve. However, the evidence available seems to indicate that the effects on the optic and trigeminal nerves were not due to the trichlorethylene itself but to certain impurities. Contact of the skin with trichlorethylene should be avoided since absorption through the skin may produce the same physiological effects as inhalation. In contact with the skin, trichlorethylene vapors, because of their solvent action on the natural skin oils, have caused the skin to become excessively dry and cracked, especially when the clothing has rubbed against the skin.

Treatment

When a person displays any of the evidences of poisoning, he should consult a physician who is familiar with the treatment of trichlorethylene poisoning. Dr. W. F. von Oettingen of the Haskell Laboratory of Industrial Toxicology, has recommended:

"In cases of poisoning by trichlorethylene, characterized by depression of the central nervous system or narcosis, the patient should be transferred to fresh air. Rest is of paramount importance. In case respiration has ceased, artificial respiration with carbon dioxide-oxygen should be started immediately. If the patient is still breathing, the administration of straight oxygen is indicated.

"Irritation of the gastrointestinal tract should be treated symptomatically by giving a bland diet and demulcents, such as starchy soups.

"As soon as there are any indications that an operator is developing a craving for exposure to trichlorethylene, he should be transferred to another operation.

"Neurological symptoms can only be treated symptomatically."

Precautions

Where possible, trichlorethylene should be used only in systems specifically designed and properly maintained to prevent the escape of harmful concentrations of solvent vapors into the atmosphere.

Where closed systems cannot be used, down draft ventilation systems should be provided and maintained to effectively remove the vapors in such a manner that they do not pass the faces of the workers.

Supplies of trichlorethylene should not be stored in plain bottles or where it is exposed to the sunlight but should be stored either in amber bottles or metal containers as it decomposes in the sunlight and forms hydrochloric acid and phosgene gas.

Care should be taken to prevent trichlorethylene or its vapors from coming into contact with open flames, burning tobacco, or hot surfaces such as electric hot plates, or steam coils because the temperature of those articles will decompose the trichlorethylene into corrosive substances such as hydrochloric acid and phosgene gas.

Smoking should not be allowed in the vicinity of equipment using trichlorethylene.

Physical examinations should be made at regular intervals of all persons using trichlorethylene.

Persons using trichlorethylene should wear clothing and gloves of materials which will protect the skin against the solvent action of the chemical.

(This is the second of a series of industrial data sheets on solvents of interest to the finishing industry, reprinted by permission of the National Safety Council, Inc., Chicago, Ill.)

Patents

Organic Coating

U. S. Pat. 2,342,387. W. E. Catlin, assignor to E. I. duPont de Nemours & Co., Feb. 22, 1944. A process for preparing a coating composition comprising a dispersion in particle size not larger than 4 microns of a synthetic linear polymeric amide, said process comprising adding with vigorous stirring a solution of said polymeric amide to a large volume of a non-solvent therefor, and then redispersing the precipitated polymeric amide obtained in a non-solvent for the polymeric amide by vigorous mechanical dispersion means which separates the agglomerates of the polymeric amide particles, said polymeric amide being the reaction product of a linear polymer-forming composition comprising reacting materials selected from the class consisting of (*a*) a mixture of diamine and dibasic carboxylic acid, and (*b*) a monoaminomonocarboxylic acid.

Coating Composition

U. S. Pat. 2,341,523. H. F. Bauer, assignor to Stein, Hall Mfg. Co., Feb. 15, 1944. A coating composition comprising a water dispersible gelatinous film forming carbohydrate binding agent and a water soluble acetate alkali metal salt containing combined but undissociated acetic acid.

Brush Wiper

U. S. Pat. 2,342,454. D. J. Covliondro, Feb. 22, 1944. A brush wiper attachment of wire for application to a container having a U-shaped depressed ring outwardly of its pouring opening, and inwardly spaced from the side wall, said wire having a straight portion adapted to extend across the ring in chordal relation thereto, each end of said straight portion having a downwardly extending U-shaped part providing vertical walls for engagement with the ring at said mouth, and the wall in said space, each of said U-shaped portions having integral there with an extension provided with a pluralit of angularly related straight sections lyin substantially in the plane of the first straight portion, each of said extensions being adapted to lie in the space between said ring and well and adapted to contact the opposite wal thereof in gripping relation.

Glossy Coating

U. S. Pat. 2,342,520. K. Stickdorn (Germany), vested in the Alien Property Custodian, Feb. 22, 1944. A luster-imparting surface coating composition comprising the following ingredients in substantially the following portions by weight, 6 parts of the hydrochrloric acid salt of an aliphatic amine substituted only by an aliphatic hydrocarbon derived from the catalytic hydrogenation of montan acid glycol ester, 5 parts of ozocerite, 19 parts of paraffin, 9 parts of turpentine oil and 61 parts of benzine.

A luster-imparting surface coating composition comprising a hydrochloric acid salt of an aliphatic amine substituted only by an aliphatic hydrocarbon radical of at least 18 carbon atoms, ozocerite, paraffin, and benzine.

Water Paint

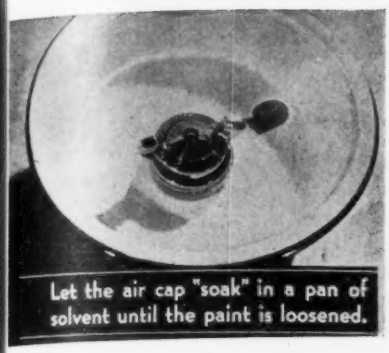
U. S. Pat. 2,342,581. G. F. Hoffmann, assignor to O'Neil-Duro Co., Feb. 22, 1944. In a high pigment water-reducible paint, the composition consisting of from 20% to 50% by weight of finely divided solid matter as pigment, from 30% to 75% by weight of slightly acid water as a dispersing medium for said pigment, from 0.25% to 4% by weight of methyl cellulose colloidally dissolved in said water, and from 5% to 30% by weight of oleo-resinous varnish dispersed as an internal dispersed phase in said water and emulsified therein with the aid of said methyl cellulose.

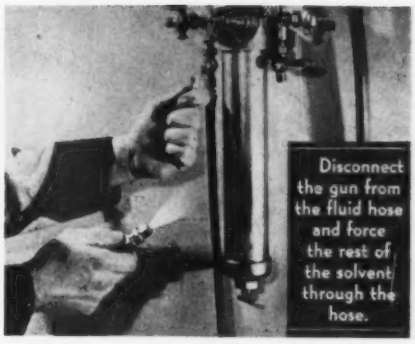
Crystallizing Varnish

U. S. Pat. 2,242,590. J. G. Lichty, assignor to Wingfood Corp., Feb. 22, 1944. A crystallizing varnish which comprises a varnish film-forming ingredient, a solvent therefor as the vehicle, and as the crystallizer a crystalline derivative of the class soluble in said vehicle and consisting of the beta alkoxy and beta aryloxy propionitriles, the beta alkoxy and the beta aryloxy propionamides and trichloropropionamides whose alkoxy groups contain up to ten carbon atoms.

Automatic Spray Gun

U. S. Pat. 2,344,108. H. A. Roselund, assignor to The De Vilbiss Co., Mar. 14, 1944. In a machine of the class described, a carrier arm swingable in two intersecting planes and having a relatively swingable wrist section, a spray gun carried by the wrist section, and mechanism having a cam pattern member and operable by predetermined movements of said member to impart predetermined swinging movements to said arm in different planes and to impart predetermined swinging movements to said wrist section relative to the arm to cause the gun to move through a predetermined path.





Training Spray Operators with Films

By LYNE S. METCALFE

New York, N. Y.

SPRAYING and the use, care and repair of spraying equipment has an important place in our war industries. Part of the war production training program has been devoted to teaching new spray operators, especially in aviation plants and in the ground service branches of the air forces. It was early found necessary to school thousands of inexperienced people quickly in the production and maintenance finishing of aircraft and, to aid in accomplishing this, two discussional type films were prepared on spraying and spraying equipment.

There is a total of 170 picture "patterns" in these films on the subject—special photographs, drawings, diagrams, charts and pictorial exhibits arranged in logical sequence so that the student may quickly learn the nature of modern spraying equipment and some of the techniques for its proper use.

For those not familiar with the reading or discussional type of instruction now being widely used in the "how-it-works, how-to-work-it" system of teaching, it may be explained that a strip of motion picture film is used. On each frame or segment of the film is a picture with letterings, labels, legends and notations. The pictures are projected on a screen and each one is discussed by the instructor and the students.

Films of this type are supplementary aids to teaching manual skills. They save as much as forty per cent of the time ordinarily required to train workers and are shown and discussed prior to shop demonstration and work practice.

The two spraying films are as follows:

1. *Spray Painting Equipment.*

A typical spraying outfit is first pictured and described, indicating its parts and their functions. Another sequence shows how it works. There follows an outline in pictures of gun construction and use and an explanation of suction, gravity and pressure feed sytems. Tanks, air and fluid hoses, agitators, connections, etc. are next pictured and explained. Finally, a visualization of air transformers and condensers is given, utilizing cut-a-way pictures to reveal interior construction.

2. *Care and Cleaning of Spraying Equipment.*

The importance of keeping spraying equipment clean and in good repair is first discussed. This is followed by a step-by-step description for the procedures for cleaning feed tanks and cups, hose, aircap, fluid tip, condensers, filter pack and air compressor. Finally, there is a sequence on lubrication of compressor and gun parts.

The accompanying illustrations show the type of information given in the films.

(Copyrighted illustrations courtesy of Jim Handy Organization.)

Business Items

Paul L. Goldstrohm and *George M. Muschamp* have been elected members of the board of directors of the *Brown Instrument Co.*, Philadelphia, manufacturer of precision industrial instruments. Mr. Muschamp is vice-president in charge of engineering of the Brown company, a division of *Minneapolis-Honeywell Regulator Co.*, and Mr. Goldstrohm is vice-president in charge of production.

Additions to the staff of the *Research Division of Cardox Corporation*, Chicago, are announced by *Dr. Charles A. Getz*, vice-president in charge of research.

Dr. Winfred L. Norem has joined the organization in the capacity of chemical engineer. Dr. Norem was formerly associated with the J-M Service Corporation. He received his doctor's degree from Johns Hopkins University in 1936.

John Lee Ballard has also been appointed as chemical engineer. Mr. Ballard was formerly an engineer with Fearn Laboratories in Chicago. He is a graduate in chemical engineering of the University of Alabama, class of 1932.

Julius Blum has retired as president of the *Dolphin Paint and Varnish Co.*, Toledo, Ohio, it has been announced. Mr. Blum, who came with the organization as works manager in 1918, was elected vice-president and general manager in 1928. In 1940 he became president. He is succeeded by his son, *Carl W. Blum*, who has been superintendent since 1922 and vice-president in charge of research, production and sales since 1929. It has also been announced that *L. E. Comes* has been elected secretary and treasurer.

Ray C. Martin, previously associated with the Chemicals Section, Plastics Division, War Production Board, has been appointed to the Coatings Division of the *American Resinous Chemicals Corp.*, Peabody, Mass. Mr. Martin, who has been associated with the finishing industry for twenty years, will work with specialty coating materials, adhesives and similar problems.

D. J. Stewart, previously assistant general manager of *Barber-Colman Company*, Rockford, Illinois, has been made Vice President and General Manager, succeeding *Mr. Earle D. Parker.*

H. F. Collins, former assistant general superintendent of Barber-Colman Company, has been appointed Works Manager

Skilsaw, Inc., Chicago announces the appointment of *Delmar M. DeWolf* as advertising manager. Mr. DeWolf is well qualified for his new position, having been assistant advertising manager and editor of the *Skilsaw Blade* for three years, and brings with him a wide background of experience in the mill and hardware distribution field.

C. R. W. Thomas

Announcement is made by *M. H. Corbin*, Sales Director of the Industrial Division of *Standard Varnish Works*, New York, of the appointment of *C. R. W. Thomas*, to their technical staff of sales and service engineers.

Mr. Thomas holds the degrees of M.A. and Ph.D. from the University of Pennsylvania. He was formerly Associate Professor at the U. S. Naval Academy in Annapolis, and Associate Editor of the U. S. Naval Institute Proceedings. He has also had many years experience directly in the protective coating industry. Mr. Thomas will be in charge of sales and service activities for Standard Varnish Works in the Baltimore territory.

Maurice A. Nehemiah has been elected vice-president in charge of sales of *Paint Engineers, Inc.*, 11 Park Ave., New York, N. Y., a subsidiary of Unexcelled Mfg. Co., Inc. and manufacturers of paints, varnishes and other protective coatings at Hawthorne, N. J.

Mr. Nehemiah is a graduate of Lehigh University and has long been associated with sales, advertising and promotion in the finishing industry.

Ernest T. Trigg, president of the *National Paint, Varnish and Lacquer Assn.*, has announced committees for the Association for 1944. Among the chairmen of the various groups are the following:

Calcimine and Water Paint Div. (Steering Committee), *C. Iddings*, Prescott Paint Co., New York, N. Y.

Natl. Industrial Finishes Div. (Steering Committee), *P. S. Kennedy*, Murphy Varnish Co., Newark, N. J.

Special Lacquer (Subcommittee, Advisory Bd., Industrial Finishes Div.), *E. H. Bucy*, Zapon Div., Atlas Powder Co., Stamford, Conn.

Roof Coating Div. (Executive Committee), *R. A. Gaines*, Phillip Carey Mfg. Co., Cincinnati, O.

Scientific Section, *F. L. Sulzberger*, Enterprise Paint Mfg. Co., Chicago, Ill.

Postwar Planning, *W. M. Clark*, The Muralo Co., Staten Island, N. Y.

Postwar Planning

Awake to the urgent need for advance action by all industry if serious post-war economic dislocation is to be avoided, the Post-War Planning Committee of the paint industry, under the chairmanship of *Elliot S. Phillips*, president of Devoe and Raynolds, has issued the following statement, a release from the Post-War Planning Committee of the *Natl. Paint, Varnish and Lacquer Assn.*, Washington, D. C.

"We, the members of the Post-War Planning Committee of the National Paint, Varnish and Lacquer Association, humbly and earnestly undertake the job of charting a course for the Paint Industry.

"We realize with great clarity, that there are definite, financially sound steps we can now take which will not impede our war work and which will result in a stronger, more efficient industry—an industry able to serve the public even more effectively in the days to come when business will surge upward and markets expand.

"Recognizing the urgency of the post-war employment problem, we are eager to make possible a greater utilization of manpower in our industry than the past has justified. Increased production means more jobs for more people. The more goods produced, the more, it follows, must be sold. That means that we must get our sales story across to the public in the most effective manner—that we must use the newest, top-flight merchandising methods.

"We recognize the fact that we must learn the exact types of coatings the public needs and desires—that we must produce and distribute them with the greatest efficiency."

Believing that the present time offers unprecedented opportunities for analyzing every facet of the paint industry and taking vitally important steps forward, the Post-war Planning Committee is hard at work on several practical programs.

New Equipment

Fungus-Resistant Lacquer

Communications equipment that soon became useless in tropical climates is now being protected from high humidity and fungus growth by a new lacquer, developed by Maas & Waldstein Company, Dept. OF, Newark, N. J., manufacturer of industrial finishes.

When our troops first entered the tropics, moisture saturated ground signal equipment and provided an ideal breeding ground for fungi. These growths, absorbing and holding water like blotting paper, covered parts of equipment and caused short circuits.

At the request of the Signal Corps for assistance on this problem, Maas & Waldstein developed a lacquer that is moisture-resistant, has high dielectric strength, and retards the growth of fungi. It is now being used on Signal and other communication equipment at our tropical bases.

The new lacquer, marketed as Dulac Fungus-Resistant Lacquer No. 86, may also be used to treat communications equipment before it is assembled and shipped to the tropics. Complying with U. S. Signal Corps Specification #71-2202-A, it is a clear, quick-drying lacquer that may be applied by spraying, brushing or dipping.

Air Velometer

The Alnor Velometer is manufactured by the Illinois Testing Laboratories, Inc., Dept. OF, 420 N. La Salle St., Chicago 10, Ill. This air velocity meter gives instantaneous direct readings of air speed in feet per minute. No calculations, no timing and no conversion tables are necessary. Extension jets permit use in inaccessible places. The Velometer is recommended especially for direct checks on exhaust systems. It is made in several standard ranges, with jets for any type of use.

Descriptive bulletins may be obtained by writing to the manufacturer.

Water Wash Compound

Traversite, a concentrated water wash spray booth compound, may be obtained from The Penetone Co., Dept. OF, Tenafly, N. J. This material is said to be an extremely potent but harmless powder which, when added to the circulating water of the spray booth, prevents fouling from the overspray and also prevents corrosion and rust.

The recommended concentration is 1½ to 3 pounds per 500 gallons of water. Following the initial charge, additions of one pound for each subsequent 8-hour work period is suggested to maintain the original potency of the solution.

Traversite, it is claimed, provides maximum wetting action with a minimum of foam, contains no caustic or trisodium phosphate and does not irritate the hands.

Portable Cleaning and Rinsing Tank

Two hot liquid dip tanks in one portable unit feature the Twin Dipmaster developed by the Aeroil Burner Co., Dept. OF, West New York, N. J., thus enabling the operator to clean and rinse metal parts and products without the necessity of carrying them to a second tank for hot or cold rinsing, it is claimed by this manufacturer. Plugs in on 110 or 220 volts A.C. or D.C. for instant heating. Equipped with two insulated compartments separated by a partition that is also insulated, the Twin Dipmaster has two removable immersion tube heating units (one for each tank) that deliver all the heat in the cleansing solution and rinse water. Separate, automatic heat control for each compartment is supplied by two thermostats regulating any required temperature from 110°-550° F. which operate independently. In addition there are two built-in thermometers registering temperatures from 100°-600° F. and four dipping baskets.

Completing the standard equipment are scum gutters, draw-off cocks, and insulated cover, pipe connections for the addition of fresh water to the rinse compartment as well as to drain off contaminated liquids and two work grilles on which bulky parts can be rested during the cleaning and rinsing processes.

Synthetic Resin

A new long oil oxidizing type alkyd resin, Rezyl 822-1, designed to meet U. S. Maritime Commission Specification No. 52-MC-1 for alkyd resin solution, has been announced by American Cyanamid and Chemical Corp., Dept. OF, 30 Rockefeller Plaza, New York 20, N. Y.

This resin is supplied in solution form and is said to meet all of the special requirements of the specification such as compatibility with raw and boiled linseed oil, mineral spirits and zinc oxide. The resin is suggested by the manufacturer for use in U. S. Maritime Commission Specification No. 52-MC-23 for quick drying red lead primer and Specification No. 52-MC-9 (Tentative) for zinc chromate primer.

Characteristics of the material are as follows:

Solids	70%
Solvent	Mineral Spirits
Color (70% Solids)	5 Max.
Viscosity (70% Solids)	X-Z
Viscosity (50% Solids)	C-F
Phthalic Anhydride (Solids)	23% Min.
Acid Number (Solids)	4-10
Linseed Fatty Acids (Solids)	60% Min.
Weight per gallon	7.9 lbs.

The manufacturer will supply further information on request.

Aircraft Putty

Although, according to General Henry A. Arnold's recent directive, Army planes have shed their relatively rough coats of camouflage paint, the aerodynamic dream of perfect wing-surface smoothness is yet unrealized.

An important step toward the irreducible minimum of "skin friction" is seen, however, in an announcement by the Du Pont Co. Finishes Division, Dept. OF, that C. W. Johnson, of its Parlin, N. J., laboratories has developed a flexible, high-adhesion aircraft putty for filling dents and cracks between riveted aluminum sheets forming aircraft wings.

So important is wing-surface smoothness in fast fighter planes that it has been seriously suggested they be wiped free of dust and other small particles by service crews before each take-off. Some idea of the toll taken by any departure from smooth surfaces may be had from the Langley Field report that a transport flying at 225 miles per hour spends 180 horsepower pulling rivet heads and lap joints through the air.

The new No. 228-711 aircraft putty, according to the Du Pont Co., has a buttery consistency and stays in place, displays no tendency to flow and therefore maintains the desired surface contour and does not sag on vertical surfaces. Both fast-drying and exceptionally low in shrinkage, the putty weighs about one-fifth less than conventional putties, always an important factor in aircraft. The product is reported under test by a number of major plane manufacturers.

Now available only for war uses, the Du Pont aircraft putty is said to have post-war value for such applications as the finishing of rough metal castings and railroad coaches.

Anti-Corrosion Films

Anti-corrosion films for steel are said to be obtainable by the use of Sublan, produced by the Glyco Products Co., Inc. Diluted with an equal amount of thin, acid-free mineral oil the Sublan was applied to highly polished steel surfaces and tested in a 90-95% relative humidity "wet saturated" with condensate forming continuously on the surface. The film thickness was that amount which adhered on cold dipping the panel and draining. After 1,200 hours there was no evidence of rust formation. Polished panels protected with the Sublan, mineral oil mixture were stored wrapped in Grade A paper for 10 months and showed no rusting. The coating passed the tests against hydrobromic acid and salt water immersion and humidity conducted in accordance with Government Specifications AXS 674. Furthermore the film suppresses latent finger prints on the polished steel surfaces. The films are readily removed from the surface by cold solvent wash or dip. For further information on Sublan apply to Glyco Products Co., Inc., 26 Court St., Brooklyn 2, N. Y.

Air Blow-Gun

W. R. Brown Corp., Dept. OF, 5721 Armitage Ave., Chicago, Ill., has announced the Speedy blow-gun for blowing off dirt and dust from castings, machined parts, etc., preparatory to painting. The gun is said to be extremely rugged, simple and light. It is provided with a pistol grip and hang hook and operates at pressures up to 250 p.s.i. The nozzle may be interchanged with long spouts for deep cavities.

Manufacturers' Literature

Air Processing Equipment

"Air Processing Equipment" is the title of a new catalog just released by Peters-Dalton, Inc., Dept. OF, designers, engineers and manufacturers of industrial equipment and complete air processing systems, 623 East Forest Avenue, Detroit 1, Michigan.

This 56-page book, shows innumerable installations of Peters-Dalton dust collecting units and systems, spray booths and equipment, ovens and ventilating and completely engineered air processing systems. It tells an interesting story of Peters-Dalton complete engineering facilities, and includes detailed specifications of Hydro-Whirl Dust Collectors and Spray Booth units together with engineering data of immeasurable value to those with air handling problems.

A copy of this spiral bound catalog will be mailed without charge to plant executives who request it on their company letterhead.

Rust Removing and Metal Cleaning

The *American Chemical Paint Company* recently published a four-page illustrated folder on Deoxidine—a product which made possible the first satisfactory finish on metal automobile bodies. This interesting folder tells why this type cleaner deserves your consideration.

Copy sent free on request to American Chemical Paint Co., Dept. OF, Ambler, Pa.

Finishes and Finishing

The New Jersey Zinc Co., 160 Front St., New York 7, N. Y., has recently issued a new number of its *Paint Progress*, a publication devoted to zinc pigments in finishing materials and to items of general interest to the finishing industry. Included are stories on a new priming paint pigment (zinc tetroxy chromate), luminiscent paints, the fire retardant properties of zinc borate, developments in war finishes, house paints and other informative and useful information.

Fire Extinguisher Maintenance

The latest addition to the practical manuals published by *Walter Kidde & Company*, fire-fighting equipment manufacturers, is entitled "Inspection and Maintenance of First Aid Fire Extinguishers." This helpful 12-page booklet is written in language the plant foreman or fire chief can easily understand, and is graphically illustrated throughout with drawings, photographs and simple charts. A basic maintenance system is outlined, including questions of supervision, record-keeping, and recharging of all types of extinguishers. The classification of the various types of fires is defined, and code-marks of the Underwriters' Laboratories which appear on the labels of all accepted extinguisher models is explained.

This manual may be obtained without charge from Walter Kidde & Company, Inc., Dept. OF, 140 Cedar St., New York 6, N. Y.

INDEX TO ADVERTISERS

ODDS and ENDS

Complaint:

Why do so many editorial writers, when discussing the problems of *small* manufacturers, insist on bringing in the chief inspector or chief engineer. Our idea of a small manufacturer is one in which the plant superintendent, chief inspector, chief designer and chief engineer are all one man. And he also tries the windows and doors himself to see if they are locked before he leaves at the end of the day.

Also, when are two pants suits coming back?—so that we can walk into a plating room without being reminded of the coats hanging in our closet because the only pair of trousers that came with them were splashed by something or other and had to be discarded. Perhaps, if all the supervisors, chemists, engineers and salesmen, whose duties require them to be dressed for the office but to pay occasional visits to plating and pickling rooms, were to pack up their useless coats and send them to Washington, someone there might do something about this situation.

Paper Shortage:

When we were first confronted with the prospect of getting out more copies of *Metal Finishing* to meet the increased demand, in the face of smaller paper allotments, it was decided that the monthly chemical and supply prices page could most easily be discontinued without fear of wails of anguish from our readers, especially since most prices were fixed anyhow.

Now, whenever anyone asks us why we feel that this feature will not be missed for the duration by our subscribers, we point with smug satisfaction to a well known journal in the metal field, which added electroplating anodes and chemicals to their price page at the time we discontinued ours. For many months now, they have been listing copper cyanide at 5.65 cents, nickel salts at 34 cents and copper sulfate at 13 cents in barrel lots, and the error has not been pointed out to them yet, causing us to wonder whether anyone ever reads the section.

Still another magazine, in their "where-to-buy" section, listed under plating equipment, *Duriron Brothers Co., Troy, Ohio.* And left out the largest manufacturer in the world!

O wad some Power the giftie gie us
To see oursels as ithers see us!

What We Learn From The Ads:

A research organization advertises that they can solve any problem for you in today's production or post-war planning, this being assured by their testing and research facilities in many fields, according to the ad. We are tempted to ask them to work out a commercial procedure for depositing magnesium on iron from aqueous solutions. On a contingent basis, of course.

We were taught, back in the days when we had hair to comb, that one bad apple can spoil the lot. Now we learn that this is due to *ethylene*, the chemical which is the source of our trichlorethylene and perchlorethylene.

The high frequency power used by a *single* plant for flowing electrolytic tin plate is equal to the total power of *all* of our conventional broadcasting stations.

Glauber's salt (sodium sulfate crystals) is named after Johann Rudolph Glauber (1603-1668) who first described it and won himself top position in the hearts of nickel platers of zinc base diecastings. We also offer for the information of the back-yard farmers a timely item to the effect that Glauber also developed the first complete artificial fertilizer.

An ad states the following: "To err is human—*and costly!*" To which we add: "And how!"

Slogan of the Month:

The More Greenbacks You Give, the Fewer Yellowbacks Will Live—Buy War Bonds.